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## Everything Just Needs to Be More PC

There are dozens of different computing devices in my home, ranging from the common—TVs, PCs, smartphones, and digital picture frames—to the unusual. Some of the more eclectic gizmos, like smart alarm clocks and various types of music streamers, deliver kick-ass functionality on their own, but there just isn't much communication between these devices. There are dozens of different protocols and software interfaces designed to foster communication betwixt electronics kit, but none of the manufacturers use them. Seems like all the cutting-edge hardware we buy these days uses proprietary cables, software, and communications protocols.

Sometimes propriety is the price of progress: A product includes some new functionality that requires more than existing technology allows. Sometimes a vendor chooses one standard over a different competing standard. And sometimes it's just sheer bloody-mindedness on the part of the manufacturer. But regardless of the reason, it's unacceptable.

Apple does a great job of integrating its gear with other Apple products, but is notoriously bad about integrating with third parties. For example, I still can't pull photos from my Flickr account into my iPhone without using a third-party app. Likewise, there's no way to stream the music collection stored on my Windows Home Server to an AppleTV, unless I use Apple's proprietary iTunes software.

Microsoft is just as bad—some MS products from the same product lines can't even talk to each other. While my Windows Home Server will stream video and music to my Xbox, the server doesn't recognize many common file types, including ones the Xbox supports! And while we're talking about it, why doesn't my Home Server speak Homegroup, the new scheme Windows 7 uses to share files and printers?

Of course, the humble PC stands in diametric opposition to all these closed, proprietary systems. There are multiple, complementary interfaces to connect to the PC—fast and slow, internal and external, wired and wireless, hardware and software. And, because these specs are open and (in many cases) royalty-free, anyone can connect to, and extend, the PC. This open platform, combined with the speed gains and cost savings delivered by Moore's Law, powers the technological revolution we're living in *right now*. Were the PC *not* an open platform upon which everyone in the industry innovated, the PC wouldn't be as fast and cheap as it is today.

So, what's my point? If you're a vendor, stop worrying about protecting your market share with proprietary cables and interfaces, and instead focus on differentiating your products the old-fashioned way: Make them better than the other guys'. If you're just a person who buys this stuff, only spend your money on products that play well with others. If your gear doesn't work as you'd expect, call the support line and demand to know why. Your gear should never be stymied by conflicting "standards," whether that aligns with the vendor's corporate strategy or not.

## GAME ON!

**Arcade Madness**  
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page 68

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page 56

*Will Smith*



**LETTERS POLICY** Please send comments, questions, and cupcakes to will@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Unfortunately, Will is unable to respond personally to all queries.

# THE NEWS Nvidia Thinks Big with Fermi

Nvidia announces its next-gen GPU architecture, but doesn't announce products -LOYD CASE

At its recent GPU Technology Conference in September, Nvidia talked up its next-generation GPU architecture. The architecture is called Fermi, after the Italian physicist who was instrumental in creating the first controlled nuclear reactor. However, Nvidia only announced the architecture, and no actual products.

Fermi is an outgrowth of previous Nvidia architectures, with more emphasis placed on general-purpose compute performance. For example, Fermi features 768KB of L2 cache. That may seem small by CPU standards, but it's substantially larger than caches in previous GPU generations, and improves performance in the more branch-heavy general-purpose computing environment. A number of other features have been added specifically to support GPU compute, such as support for ECC (error checking and correction) memory configurations and new instructions specifically for GPU compute standards, such as OpenCL and DirectCompute 11.

Another key feature of Fermi is increased support for parallel execution by implementing concurrent kernel execution, where different kernels of the same application context are executed simultaneously.

Nvidia was cagey about releasing other hardware specs, but did note that the top-end versions will offer a 384-bit memory interface and six 64-bit memory partitions, supporting up to 6GB of GDDR5 memory. Floating-point operations are fully IEEE 754-compliant (both single and double precision.) The company was also mum about performance, stating only that floating-point performance should be 4.2x faster than previous generations.

At 3 billion transistors, Fermi will be a massive chip. Contrast that with AMD's HD 5870, whose 2 billion transistors consume 334mm<sup>2</sup>—at 40nm. Given the 1/3-higher transistor count, you're looking at a die size well north of 400mm<sup>2</sup>. It will be interesting to see whether Nvidia can get good yields on such a large chip built on the demanding

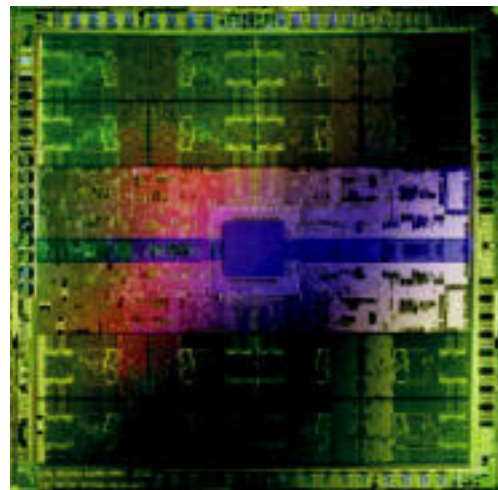
40nm process.

Perhaps the coolest thing Nvidia announced in conjunction with Fermi was Nexus. Nexus is a software development environment designed to coexist with Microsoft's Visual Studio. Nexus allows very granular debugging of GPU code and standard CPU code in a single environment, with full visibility into the state of the GPU. Nexus will support Nvidia's own CUDA, plus DirectCompute 11 and OpenCL. So Nexus presents a completely API-agnostic approach for Windows programmers, allowing them to use their API of choice.

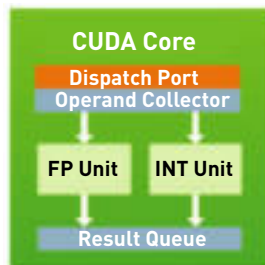
For all the talk of GPU compute, Nvidia was pretty quiet about an actual graphics product, saying only that it will be coming as soon as possible. One source noted that chips were back from the fab, and being brought up in Nvidia's test labs, and the testing was progressing "as expected." No discussion of pricing was mentioned, other than that product pricing would be "in line with its performance and value."

Nvidia did acknowledge that thermal performance would be worse than with AMD's new Radeon HD 5870, but once again avoided specifics, saying only that thermal performance would be "what you'd expect with a current-generation graphics card."

Whether we'll see graphics cards built on Fermi before the end of 2009 is anyone's guess. But with AMD currently owning the single-GPU performance crown with the relatively affordable HD 5870 and 5850, the pressure is on.



Nvidia is thinking really big with its new Fermi GPU architecture: more than 3 billion transistors big. That suggests a die size in excess of 400mm<sup>2</sup>.



Fermi's streaming multiprocessors represent the most granular self-contained blocks, which will be used to engineer actual chip products.



TOM HALFHILL

## Rethinking Graphics

I've had fun shopping for graphics cards, especially when a power user is within earshot. I'll innocently ask the salesperson, "What's your slowest graphics card?" The reaction is precious.

As I've confessed before, I'm not a gamer. Years ago I edited a videogame magazine and didn't realize how weary I had become of games until the magazine unexpectedly folded. I stopped playing that day and haven't resumed since. That's why I don't need fast graphics. Playing a YouTube clip is the most taxing graphics workload demanded of my computer.

Often, I won't even buy a graphics card. I'll scrounge a hand-me-down from a friend or cannibalize a junked PC. My oldest computer in regular use contains a discarded engineering sample of an Nvidia GeForce4 Ti-4200 from 2002.

Are you cringing yet? Mock me no more, power users. I'm reconsidering my wayward ways.

Not that I'm renewing an interest in games. I'm still such a nerd that I'd rather punch code than shoot pixels. No, what's making me waver are the *nongame* programs for GPUs. This software is enabled by Nvidia's CUDA platform for general-purpose computing on GPUs, AMD's similar ATI Stream, Microsoft's Direct Compute API, Apple's Grand Central Dispatch, and Khronos Group's OpenCL. I've been around the industry a while and don't use the term "revolutionary" lightly, but GPU computing is the most exciting thing I've seen in years.

It also changes the equation for PC shoppers. There are legions of us nongamers, you know. For years we've been happy with crappy graphics. But now, if we want to clean up our amateur video, we need a graphics card that can run MotionDSP's vReveal. If we anticipate transcoding much of that video, we'll want a system that can run Elemental Technologies' Badaboom. If we're editing high-res digital images, we'll crave a GPU that accelerates Adobe Photoshop.

GPU computing will alter the priorities of users and system designers. Bargain PCs that safely economized on graphics suddenly seem less attractive. Eventually, even casual users will grasp that the performance of some apps will depend more heavily on the GPU than on the CPU. And that's definitely a game-changer.

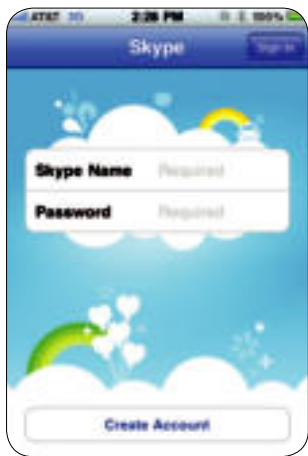
Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

## Big Gains Ahead for Android

Google's open source Android platform will turn one year old later this month, and according to research firm Gartner, the OS is about to hit a major growth spurt. While Android can be found on fewer than two percent of all smartphones today, Gartner predicts a seven-fold increase in global Android-based handsets by 2012.

That would put Android in second place, trailing only the Symbian OS, which today accounts for nearly half of all smartphones but is expected to drop to 39 percent in 2010, according to Gartner. Gartner acknowledges that T-Mobile's G1—the first Android-based smartphone—was met with a mixed response from consumers, but the research firm believes Google's continued backing of Android and its focus on cloud computing capabilities will propel the platform to 14 percent of the smartphone market in just a couple of years.

"Google's other up-and-coming consumer and enterprise products should make [Android] a dominant platform," Ken Dulaney, VP of Gartner Research, said in a recent interview. Dulaney also predicted that there could be as many as 40 models of Android devices shipping in 2010. —PL



## AT&T Allows iPhone VoIP

Finally yielding to public and FCC pressure, AT&T has agreed to the use of iPhone VoIP apps on its 3G network. Skype was extremely excited by the news, given that 10 percent of all iPhone and iPod Touch users have downloaded its popular VoIP application.

AT&T's announcement that it would open its 3G network to Internet calling applications for the iPhone first appeared in an FCC filing. It will be interesting to see where this leaves the much debated Google Voice application, rejected from the Apple App store earlier this year. —JB

## Nvidia Disables Accelerated PhysX for ATI Users

In Windows 7, power users are again able to install videocards from multiple vendors, which initially meant that intrepid users could use an ATI graphics cards to display graphics, while an Nvidia card powered hardware-accelerated PhysX in games. But Nvidia put an end to that with driver version 186, disabling hardware-accelerated PhysX anytime a non-Nvidia GPU is present in the PC. The move affects even owners of stand-alone PhysX cards.

When asked about the prospect of supporting PhysX in these systems, Nvidia Senior Vice President Tony Tamasi said, "The biggest issue is support. That's the honest answer... We don't want to test [systems with multiple vendors' GPUs]." Luckily, there are several ways to work around the limitation. Check page 92 for the full scoop. —ws

Even machines with dedicated PhysX cards won't get hardware-accelerated PhysX if there is a non-Nvidia GPU present.



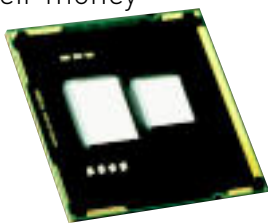
## 32nm CPUs Come to Town

And give 45nm processors a run for their money

Quad-cores are faster than dual-cores, right? Not anymore. According to Intel, its upcoming 32nm mainstream dual-core CPUs, code-named Clarkdale, will outpace some 45nm Core 2 Quad CPUs. It won't happen in all tasks, but Intel says that, thanks to aggressive Turbo Boost, increased memory bandwidth, and built-in hardware-encryption support in 32nm CPUs, Core 2 Quad's goose is cooked.

appear only in LGA1366 platforms. The company also said it is highly unlikely we will see a six-core processor in the mainstream LGA1156 platform.

Road warriors will get their power fix through Intel's newly announced Clarkdale CPUs. Essentially mobile versions of the desktop quad-core, hyper-threaded Core i5/i7, these CPUs promise far more performance than today's



Intel's upcoming 32nm dual-core CPUs will be faster than some quad-cores.

to arrive later this year. Both of the dual-core 'dales will introduce a graphics processor sitting next to the 32nm processor core.

Intel also plans to "Nehalemize" the Atom with its upcoming Pineview processor. Pineview will be an updated Atom CPU with an integrated memory controller and graphics processor. Pineview should lower costs and, unfortunately, lock out Nvidia's Ion chipset from the game. —GU

## IT IS HIGHLY UNLIKELY WE WILL SEE A SIX-CORE PROCESSOR IN THE MAINSTREAM LGA1156 PLATFORM

Intel has also finally calmed the nerves of early adopters by confirming that, indeed, the upcoming six-core, 32nm CPU code-named Gulftown will

Core 2 Quad mobile CPUs, with less power consumption and lower thermals, to boot. The mobile version of Clarkdale, code-named Arrandale, is also expected

### STORAGE

## Honey, I Shrunk the SATA

If you think this is a Mini PCI Express card, you're wrong. It's the new mSATA spec, which has appropriated the Mini PCI Express slot and formfactor for an even smaller storage card. Don't worry, the SATA standards body says there's no danger of mixing up the two because they're "not user accessible." Oh, really? —GU



### GAME THEORY



THOMAS MCDONALD

## Monkeying with the Classics

Do you want to know how long I've been doing this? So damn long that I covered the original Monkey Island games. Friends, back in my day, we had only two colors (black and not-black—and black's not even a color!), and we liked it!

Actually, it kind of sucked, and one of the pleasures of covering games throughout the 1990s was watching sound and image improve to the point that spectacular graphics barely warrant a mention. If you can't make a game look and sound good in 2009, you really should be making something other than games. Burgers, perhaps.

It's illuminating to be able to play something you remember fondly from ye olde days, only with the ability to hotkey back and forth between the old game and a shiny new version. The Secret of Monkey Island: Special Edition is a gorgeous hand-painted version of the original game, with a slightly "improved" interface. This has been laid right on top of the old game, and the most fascinating thing is the ability to hotkey 19 years into the past with each new screen.

There's always a danger when revisiting something you remember fondly, that it might not hold up. The Secret of Monkey Island doesn't quite hold up, and its place in the canon of classic games has a lot to do with its charm, characters, and novelty, and less with great puzzles or riotous dialog. Compared to the SCUMM games that came in its wake (Day of the Tentacle, Indiana Jones and the Fate of Atlantis, and two great Monkey Island sequels), it's not quite as funny or clever.

Memory is a deceptive thing. Over the years, a lot of gamers (myself included) have attached a lot of retroactive quality to the early days of PC gaming, which makes opportunities like the Special Edition instructive. I had a similar response when I revisited some Infocom text adventures in a fit of nostalgia and lasted about 10 minutes before wanting to put a fist through my screen. Next time some old gamer says, "They don't make 'em like that any more," hand him a copy of Arkham Asylum and say, "Thank God for that."

Thomas L. McDonald has been covering games for 17 years. He is an editor at large for *Games* magazine.

## Charge4All Portable Charging Mat

**T**oday, it's not a question of whether you'll forget a power brick when you go on vacation, it's a question of which one you'll forget. That's where Charge4All's Portable Charging Mat (\$40, [www.charge4all.net](http://www.charge4all.net)) comes in. Built around a tube that can charge up to four devices simultaneously, the Portable Charging Mat rolls into a compact and easy-to-pack unit, so you'll never forget a charger at home again. —**eu**



QUINN NORTON

## A Nobel Cause

**E**linor Ostrom recently became the first woman to win the prestigious “fake” Nobel prize for Economics, for her research on how self-governing groups successfully share resources. She spent years refuting the idea of the Tragedy of the Commons—a thought experiment dating from 1968 that basically said anything shared would get spoiled because people would only value something they owned. The man who authored the idea, Garrett Hardin, presumably observed very unruly preschoolers.

Ostrom actually looked at how people share finite resources like forests and grazing land, and found that with the right ground rules people not only did fine, they did better than companies and governments. Yipee for her and all, but why am I telling you about it in a column about digital rights and IP?

Turns out Ostrom laid the groundwork for thinking about the commons, including our very own digital commons. Her work also shows in economically solid terms how and why total monopoly rights, like copyright and patent, might not always be the best for society. Ostrom showed that, when a commons can manage itself, the proximity of the users and the governance, i.e., the two being the same thing, makes the system work more efficiently than either centralized government or strong property rights.

Nearly all digital-rights projects—Free Culture, Creative Commons, Wikipedia, Linux, and even HTML and TCP—were produced by self-organizing structures, owned by no one, and not run by government. Without official recognition of work like Ostrom's, they're also economic unicorns, entities that don't exist because they can't exist, no matter how much they are kicking butt. They're invisible to many politicians, academics, and business people. They can't be funded or acknowledged, they can't be suggested, and what they have must be taken away as quickly as it's noticed, and handed to either private industry or public administration. This recognition is great news for those of us who want to see the digital commons respected and considered seriously when lawmakers or executives make decisions that might affect the net.

Sure, media sharing, open source, and the Internet might have long worked in practice, but now they work in theory, too.

Quinn Norton writes about copyright for *Wired News* and other publications. Her work has ranged from legal journalism to the inner life of pirate organizations.

## Last.fm Now on FM Radio

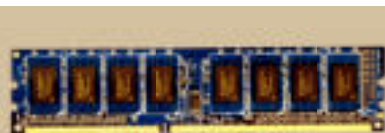
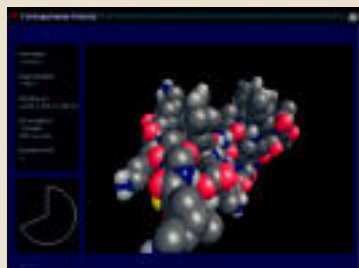
CBS tries to revive airwaves with social music model

**I**nternet radio station Last.fm has moved from the confines of your computer and handheld gadgets and onto your local radio station. In October, Last.fm's parent company CBS kicked off the Last.fm Discovers station in New York, Los Angeles, San Francisco, and Chicago, as one of its Radio HD broadcasts. The station's programming will be driven entirely by

the Last.fm weekly charts and include “Last.fm Recommends with Bryan Van Gelder,” a program that plays a popular song on Last.fm followed by two related and recommended songs; “Last.fm Discovers with Sat Bisla,” which focuses on weekly charts; and “Shouts,” where comments left on Last.fm about specific songs will be read aloud followed by a given song.—**PL**

## Computing for a Cause

For almost a decade, Stanford's Folding@home project has been using distributed computing to study the mysteries of protein folding in the hopes of finding cures for many common diseases such as Parkinson's, ALS, and Alzheimer's. You can help by lending your idle CPU or GPU to the cause. Download the appropriate software client for your system at <http://bit.ly/LqOt4>, and join the Folders of Team Maximum PC (team 11108). Visit our Folding forum for details (<http://bit.ly/nooGC>). —**KS**



## Dual-Channel RAM in One DIMM

With six-core CPUs around the corner, why are we still using single-threaded memory modules? That's the challenge Rambus and Kingston are trying to overcome with a new threaded-DIMM design proposal for building a dual-channel DIMM using today's commodity parts. The threaded modules would offer up to 50 percent more bandwidth over a typical DDR3/1600 module and reduce power consumption, as well. Sounds good, right? Now we just need PC makers to get on board. —**eu**



# THE LIST

## 9 Nerd Holidays

**9 TOWEL DAY**  
MAY 25



Celebrate the works of Douglas Adams by toting a towel all day.

**8 PI DAY**  
MARCH 14 (Get it?)

**APRIL FOOLS' DAY**  
APRIL 1

**6** Breaking news: April Fools' Day moved to July.

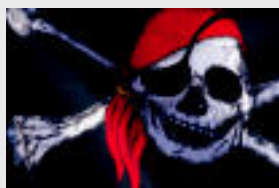
**FESTIVUS**  
DECEMBER 23

**7** It's for the rest of us.

**5 BLACK FRIDAY**  
THE DAY AFTER  
THANKSGIVING  
The only thing nerds will stand in line for, besides Comic-Con.

**4 JUDGMENT DAY**  
AUGUST 29  
No, the actual Judgment Day, when Skynet went self-aware.

**3 TALK LIKE A PIRATE DAY**  
SEPTEMBER 19



Avast, ye scurvy land-lubbers!

**2 PC'S BIRTHDAY**  
AUGUST 12  
In 1981, the first PC, IBM's 5150 went on sale for \$1,600.



**1**

**HALLOWEEN**  
OCTOBER 31

The one day a year it's socially acceptable to wear your *Ghostbusters* costume in public!

This month the Doctor tackles...

# ▶ Upgrading a Notebook CPU

## ▶ eSATA Speeds

### ▶ How Full is Too Full?



#### CPU Better Recognize

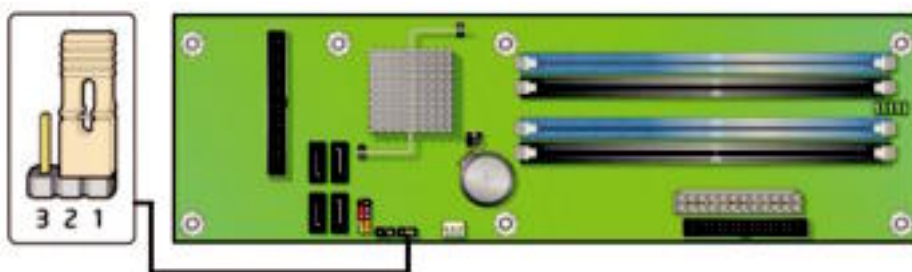
I have an Acer Aspire 5100 with a Phoenix BIOS. It came with an AMD Turion 64 single-core processor; I decided to upgrade to an AMD Turion 64X2 TL-64 dual-core processor. The computer recognizes everything but the processor model: In Device Manager it says "AMD processor model unknown." The computer recognizes both cores of the CPU and gives the correct clock speed. How do I get my computer to recognize the processor model?

—Kevin Rush

First, Kevin, props for upgrading a notebook CPU. The problem you mention can happen if your BIOS revision predates the introduction of the CPU you're using. To fix this, download the most recent BIOS revision for your notebook from Acer (<http://bit.ly/2IRHRF>)—as of press time, that is v3.13, released in March. Of course, it's not the end of the world if your computer doesn't recognize its processor's name, as long as it gets the cores, clocks, and voltages right.

#### There are Three Beeps!

I had a problem with the speed on my Intel



Some Intel boards have BIOS configuration jumper blocks, which are used to reset the BIOS to its defaults. If your Intel board won't POST, try resetting the jumpers.

motherboard so I went into the BIOS and reset the RAM speed to 800MHz. On restart, I got three beeps, which signals a RAM failure or RAM not recognized on my board. Is there a way to reload the BIOS? I have tried resetting the CMOS by pulling out the battery but I still get three beeps with no POST. I even used the ISO method to create a BIOS disk image for a boot-from-disk, but the board still does the same thing.

I get nothing. No HDD light, no monitor. I even pulled the RAM and replaced it, and still nothing. The system is only six weeks old and it's built on an Intel DQ963FX, Pentium E2200, Nvidia 9400 GT, 4GB of Kingston 1GB DIMMs, and a 650 watt power supply.

—Jim Murray

You might be running into that strange feature of Intel boards involving the configuration jumper. Or, technically: the "BIOS Configuration Jumper Block." This jumper has three modes. Your board should have shipped in "normal mode," or 1-2. If you throw it into "configuration mode" by setting it to 2-3, you can reset the BIOS value you want. This will also let you clear any BIOS password. Pulling the jumper completely from the header will set it to "recovery mode," which recovers data if you have a bad BIOS update. The Doctor assumes you haven't tried resetting the BIOS using this jumper, since no vendors besides Intel use a system like this. Assuming you didn't kill the system with your BIOS restore attempt, or damage the RAM during the troubleshooting, this is likely the

solution to your problem.

If the jumper isn't the culprit, you may have defective memory or a broken board, which would require replacement or repair. To determine which component is at fault, try dropping the memory into a system you know works properly. If it works there, the motherboard is suspect, but if it doesn't, you probably have bad RAM.

#### Clogged Pipes

I just bought a used PC running Windows XP. It had been really fast loading and running programs and accessing the web, but suddenly it slowed down to a complete stop. I had to unplug it just to shut it down.

So, I unplugged the Ethernet cable and it worked fine. I scanned the C: drive—no virus. Plugged the Ethernet cable back in and it slowed down again. Unplugged the Ethernet and it's fast again. What's going on, Doc?

—Tim



**SUBMIT YOUR QUESTION** Are flames shooting out of the back of your rig? First, grab a fire extinguisher and douse the flames. Once the pyrotechnic display has fizzled, email the doctor at [doctor@maximumpc.com](mailto:doctor@maximumpc.com) for advice on how to solve your technological woes.

That's definitely suspicious behavior, Tim. It sounds like something is trying to send or receive lots of data, and we don't like it when programs do that without our explicit consent. You're likely either the victim of some bizarre Denial of Service attack or you're the victim of some sort of virus or other malware, even if you're not detecting anything. It's always good to do a clean install of Windows on an upgraded or new-to-you PC. Make sure you're running both a firewall and antivirus software. Short of that, our Ultimate Malware Removal Guide (<http://bit.ly/18BEOf>) can help you root out any nasties that might be responsible for this egregious behavior.

### Overclocks Not Registering?

Doc, I'm trying to overclock my Core 2 Quad Q6600 from its stock speed of 2.4GHz to 3.5GHz. But

**when I set the overclock and boot back into Windows, nothing shows the overclock as working. The OS as well as CPU-Z show 2.4GHz on my Gigabyte GA-EP45C-UD3R board. I'm running RAID 0, 4GB of G.Skill DDR2 RAM, and Windows Vista 64-bit.**

—Al Stein

First, you're asking an awful lot of a Core 2 Quad Q6600 on air cooling. It is a great overclocker considering its stock speed of 2.4GHz, but you probably should not expect to push it to 3.5GHz on air and see great results. What you may be seeing is Intel's SpeedStep throttling the CPU back when it isn't under load. Just to make it clear, at stock speeds, your CPU uses a stock front-side bus of 266MHz on a 9x multiplier for a total of 2.4GHz. Since you have no option of doing a clock-multiplier overclock (because the multiplier on your Q6600 is locked), you are likely running your front-side bus

in the region of 395MHz. On a 9x multiplier, that's about 3.5GHz. The SpeedStep on that processor will actually crank back the clocks by lowering the multiplier from 9x to 6x. It just so happens that a 6x multiplier on a 395MHz bus is about 2.37GHz, which the OS may round to 2.4GHz. To test this theory, put a load on the CPU and see if the clocks move up.

### Soundcard Interface Woes

**I have a problem with my X-Fi Platinum setup. It worked fine on my old Dell 8200, but I recently upgraded my mobo to an EVGA nForce 780i and now the front ports don't seem to work. What gives? I reinstalled the drivers several times and nothing. The main card works just fine, but the drive bay interface is the whole reason I bought the card in the first place.**

—Rocco Nicoletta

Since the card works with the rear ports for both output and input, the Doctor is going to assume it's something as simple as a loose connection or damaged cable that occurred during the motherboard move. You should power down and unplug your system. Open the side up and find the ribbon cable that goes

from the I/O front panel to the X-Fi Platinum. Those old ribbon cables are easy to mess up and plug in incorrectly. Unplug it on both ends and then reconnect, making sure you have firmly plugged into the card and the auxiliary panel. Also, make sure you have the front panel's four-pin power connector (the same as a floppy drive's) plugged into the PSU.

### SSD Slowdown

**I plan to install a second-generation Intel X-25 80GB SSD drive in my system. I have heard that SSDs suffer speed losses when they are written over compared to when they are new. How would a page file affect this?**

—Jon Coulter

Yes, many SSDs suffer slowdowns when writing over memory blocks that have previously held data, which is why the TRIM command (see this month's White Paper) was introduced. Windows 7 supports the TRIM command, which is basically a garbage-collection routine that prevents this type of slowdown during writes, and many drive manufacturers have released similar garbage-collecting programs—usually named wiper.exe or something similar—for you to run on



Many SSDs, like Intel's second-generation X-25M SSD, support the TRIM command, but the company's first-generation SSDs don't.

your SSD periodically. Though Intel's first-generation X-25M drives do not support TRIM, the second-generation drives, like the one you're thinking of buying, do.

### Waiting on a CD

I recently moved my Windows XP partition to a new hard drive using Partition Magic 8. After this, the computer hangs at the Boot from CD prompt. I then installed Windows 7 RC on another partition. It still hangs at the Boot from CD prompt unless I put a bootable disk in the drive and let the timer expire. Then it will boot into Windows 7.

Partition Magic says that my Windows XP install partition is healthy (active, primary partition) and my Windows 7 partition lists healthy (boot, page file, crash dump, primary partition).

—Levi Harp

mending how fast it was with the CAS latency of 3. However, when I installed the RAM, I got a BSOD before Windows XP could load, with an IRQL\_NOT\_LESS\_OR\_EQUAL error. I know it's a problem with the memory because when I stick the stock RAM back in, it boots fine. I've checked the BIOS for options to increase the CAS latency but I can't find any option to do so. Am I out of luck with this RAM?

—Jarad Nogle

Afraid so, Jarad. Asus's Eee BIOS doesn't let you change your RAM timings. And the Intel GSE945 chipset's maximum supported RAM speed is PC4200 533MHz, with timings of 5-5-5-15 or 4-4-4-12. So, unfortunately, you're out of luck. On the bright side, 2GB DDR2/553 SODIMMs are less than

can make accessing your data take longer. You also need to keep a certain level of free space on your drive to accommodate temporary files and virtual memory—not enough, and your system can slow to a crawl. Our general rule of thumb is to defragment mechanical hard drives regularly, run trash-collection (e.g., TRIM) on your SSDs, and keep at least 10 percent or 20GB—whichever is less—of your drive's space free at all times.

### eSATA Speeds?

I have an HP HDX18T laptop with an external drive that holds my old stock 250GB/5,400rpm 2.5-inch drive. The external case uses an internal SATA connection and has both a USB 2.0 and eSATA connection externally for my laptop. I've read that there is a theoretical transfer rate of 4GB/s with eSATA, but I'm lucky to get 40MB/s copying to or from. Can you tell me what I'm missing? BTW, the

external drive case is an Eagle ET-CS2PESU2-BK.

—James Lamar

James, eSATA has a maximum throughput of 3Gb/s. That's gigabits, though, not gigabytes. So, figure around 300MB/s, less overhead. However, you won't see many mechanical hard drives actually reach those speeds—the fastest consumer-level hard drives barely get 200MB/s sustained read speeds, and a 250GB/5,400rpm drive doesn't even approach that. You're constrained in this case not by the transfer speeds of the eSATA connection, but by the mechanical speed of your hard drive. Especially if you have an older drive, 40MB/s sounds pretty reasonable for a 5,400rpm device. But look on the bright side: It's still faster than you'll get using the USB 2.0 interface. ☺

## THE MORE DATA THERE IS ON A HARD DRIVE, THE EASIER IT IS FOR THE DRIVE TO BECOME HIGHLY FRAGMENTED

If you're stuck on the Boot from CD prompt, your best bet is to give the disk you want to boot from a higher priority than your optical drive. Go into your BIOS (by pressing Del or F10 at startup, depending on your BIOS manufacturer) and set the boot order so that whichever device you want to boot from—that is, whichever hard drive has your master boot record on it—is first on the list. Assuming nothing's changed in your system, Windows 7 will write the code it uses to boot in the active partition on the first hard drive in your boot order. You can set the CD-ROM drive to boot first next time you need to boot from a CD.

### Netbook RAM Timings

I recently bought an Asus Eee PC 1005HA-B from Best Buy. I wanted to upgrade the RAM to 2GB, so I bought a Kingston HyperX 2GB PC4200 (533MHz, 3-3-3-8 timing) SODIMM from Newegg. It received a lot of great reviews, with other netbook owners com-

\$30. Even if you can't get your money back, you won't be out a fortune. But Kingston tends to have very good support; see if the company will let you exchange the RAM for one with looser timings that your Eee won't gag on. And at such low processor and bus speeds, we doubt you'd be able to tell the difference between 3-3-3-8 and 4-4-4-12 RAM, anyway.

### How Full is Too Full?

I've often heard the rumor that a full hard drive is significantly slower than a mostly empty one. Despite my black belt Google-fu I am unable to find any stories, articles, or write-ups to elaborate on this. How much slower? At which point is a hard drive too full—60 percent? 90? When should I start looking for a bigger drive?

—David Seber

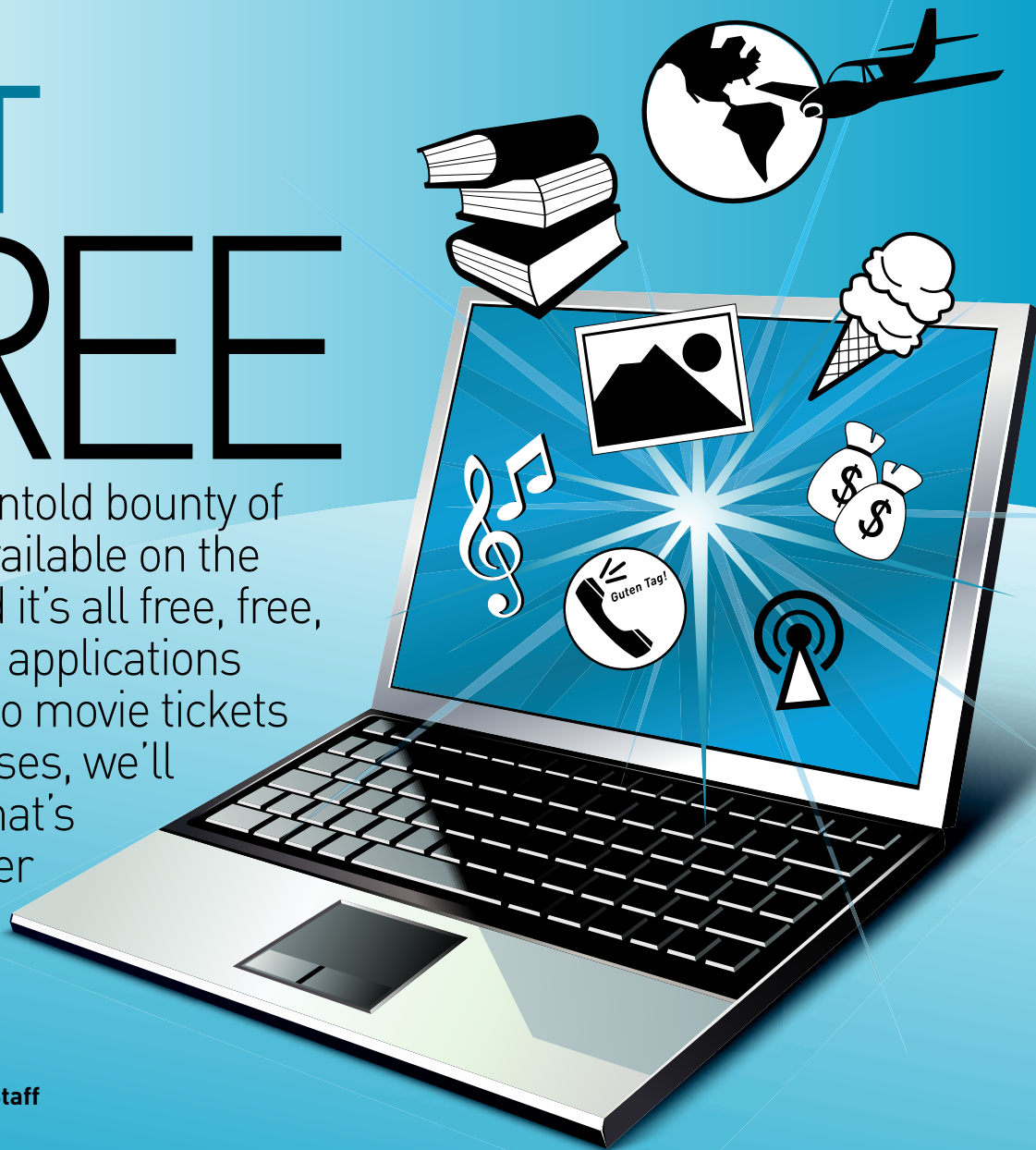
The more data that's on a hard drive, the easier it is for the drive to become highly fragmented, which

# GET FREE

There's an untold bounty of awesome available on the Internet, and it's all free, free, FREE! From applications and games to movie tickets and mattresses, we'll show you what's safe and steer you away from the unsavory

By the Maximum PC Staff

As inhabitants of the Internet, we've become so inured to the hyperbolic advertising and questionable offers that we miss the incredible values that are ripe for the taking. If you know where to look, you can find all sorts of awesome stuff available for the low, low cost of \$0. Whether you're looking for a great image management app, free AAA games, or the proverbial free lunch, we can tell you where to find it. But wait, there's more! We'll also show you three things that seem free, but really *aren't*.



## GET FREE FINANCIAL ADVICE

We know how it is. You want to get your finances in order but don't know where to start. Well, try starting at Mint.com, a free, easy-to-use, and secure financial-planning website.

Mint.com offers all kinds of useful tools to help you track your spending,

create a budget, pay down your debt, and save for your golden years. By analyzing all your banking, credit card, and investment account information, as well as your spending habits, Mint.com makes informed suggestions about how you can get more from your moolah.

## Host a Hassle-Free Virtual Private Network

Need to access files on your home computer while you're at the office? A virtual private network will give you a direct link to your desktop over the Internet, and the easiest way to set one up is with Hamachi (<http://bit.ly/7kThj>). With almost no configuration required, Hamachi will connect two computers as if they were on the same local network, even if they are behind NAT firewalls. Use Hamachi to facilitate secure remote desktop sessions or even host LAN multiplayer games over the Internet.



## Blog with the Best of Them

Microblogging has become all the rage these days, making our lives accessible to anyone who cares. But Twitter's 140 character limit leaves us desiring far more room to rant. Fortunately, full-fledged

[www.tumblr.com](http://www.tumblr.com)  
[www.blogger.com](http://www.blogger.com)  
[www.typepad.com](http://www.typepad.com)  
[www.wordpress.org](http://www.wordpress.org)

daily goings on with the rest of the world, gratis.



## Store and Share Your Files Online

We've touted this web storage service before, but Dropbox ([www.getdropbox.com](http://www.getdropbox.com)) deserves another mention. Its seamless synchronization and file-history tracking features raise it above other free cloud storage services. A Dropbox account entitles you to 2GB of free cloud storage for your files, which can be accessed on a web browser or with the cross-platform Dropbox client (now available as an iPhone app). Tip: Expand your free account's capacity to up to 3GB by referring the service to new users.

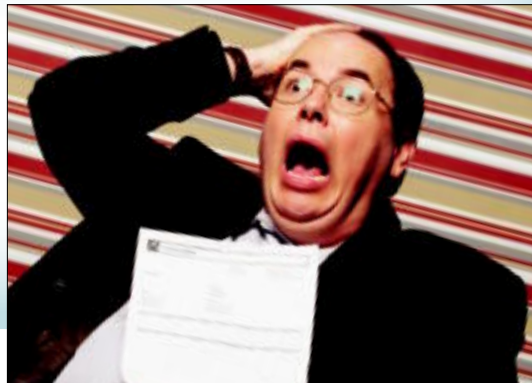
## bing Dial Directory

### without Paying a Cent

Remember when calling 411 for directory lookups was actually free? We do, and we want those halcyon days back. Both Google and Microsoft have set up toll-free numbers that provide directory assistance, each with unique features. 1-800-GOOG-411 will let you look up the address and phone number for businesses as well as nearby intersections (it can also text you a link to an online map). Microsoft's 1-800-BING-411 offers similar directory information, but will also dictate turn-by-turn directions from wherever you are and provide local weather condition updates.

## Claim Your Complimentary Annual Credit Report

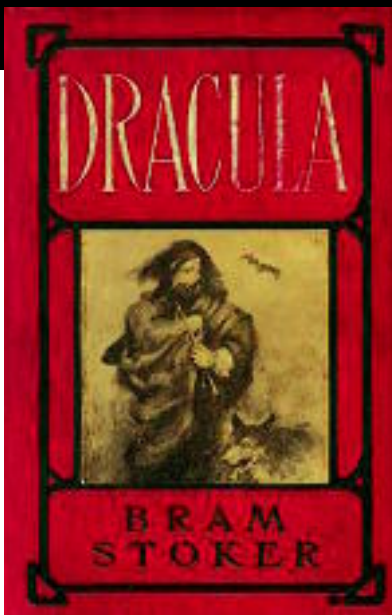
Under federal law, you can claim one free credit report per year, but many people have been scammed into paying for credit reports under this entitlement. The only website that actually provides your one free report is [Annualcreditreport.com](http://Annualcreditreport.com). You'll get a report from three nationwide agencies: Experian, Equifax, and TransUnion. Alternatively, you can call 1-977-322-8228 to request the service.



## ENTERTAINMENT

### Read the Literary Classics

We know you've been ogling the newest generation of ebook readers, what with each new model more capable and cheaper than the last. But if you need yet another compelling reason to take the plunge, consider all the free ebooks available to you through Project Gutenberg ([www.gutenberg.org](http://www.gutenberg.org)). The site's nearly 30,000 public domain ebooks provide a great opportunity to brush up on the classics—think Mark Twain, James Joyce, Emily Bronte, and Charles Dickens.



### Listen to the Literary Classics

OK, so you're not all that into reading... Let someone else do the work for you, while you sit back and enjoy many of those same works of classic literature on audiobook. LibriVox.org is committed to creating audio recordings of all the books available in the public domain. To this end, the site organizes volunteers to record and post the books' chapters as audio files (available in both MP3 and OGG formats) for easy searching and download.



### Make Google Books Your Personal Library

Working document scanners overtime (at a rate of more than 1,000 pages per hour), Google has compiled a massive database of books, magazines, and newspapers that can be browsed and searched online (<http://books.google.com>). Many of these texts are in public domain so you can download a PDF copy, and the comprehensive periodical section (yes, *Maximum PC* is on there, as well) is great for browsing the vintage collections of publications like *Life* and *Popular Science*.

### STREAM MOVIES AND LIVE TV TO YOUR PHONE



Placeshift your media content from your desktop to a variety of mobile devices with the freeware Orb application ([www.orb.com](http://www.orb.com)). Like the Slingbox service, Orb uses your Internet connection to broadcast videos and music to any broadband-enabled laptop or phone. Media files are transcoded on the fly, including online content from YouTube or even live TV if your host machine is equipped with a TV tuner. Orb even supports webcam streaming, so you can use it as a home-monitoring service.

## Revel in Classic and B-Movies

Sometimes you just have a hankering for a good old-fashioned schlocky B-movie, or a poorly dubbed martial arts flick, or a lighthearted Buster Keaton romp or old-timey Popeye cartoon. All such possibilities, and more, await you at Public Domain Torrents ([www.publicdomaintorrents.com](http://www.publicdomaintorrents.com)). This free, legal torrent site is nicely organized by genre, offers user comments and a forum, and often features multiple versions of a title suitable for various portable devices.



## Enjoy Movies, Concerts, and More

Not only does Archive.org host the Wayback Machine, which contains archives of more than 150 billion web pages from 1996 to the present, but the site is also home to more than 200,000 films, from classic Charlie Chaplin to modern CC releases like *Sita Sings the Blues*. Oh, and its Live Music Archive has thousands of live recordings from artists like the Grateful Dead, Camper Van Beethoven, and Spoon. The text archive contains more than a million public-domain and Creative Commons works.



## Not All Music Costs 89 Cents a Track

Music blogs all over the Internet transformed the tedious chore of finding and discovering music into an enjoyable and rewarding hobby. Sites like Hype Machine ([www.hypem.com](http://www.hypem.com)) aggregate music of all genres from various blogs, and a majority of these downloads come from independent labels that don't mind if you share the music, since they're either mixes of other songs or promotional tracks.

You can also find free tracks at Amazon's MP3 store ([www.amazon.com/mp3](http://www.amazon.com/mp3)). Simply type "Free mp3 downloads" into Amazon's search query and it will return a list of the week's featured music artists.

## Stream Music Online

We discovered that without our media players on hand, our productivity levels can be quite low. Thankfully, sites like Last.fm, Slacker.com, Pandora.com, and Grooveshark.com offer free music streaming to help pass the time when you've got a bad case of the Mondays. Or, if your personal music collection isn't up to your guests' tastes, let the Internet be your party's playlist for the night—no download required.

### ONE-STOP SHOP

## The Best of SourceForge

The world of free and open-source software is massive. There are open-source and freeware apps for every task you can imagine. And one of the best places to get open-source software is SourceForge ([www.sourceforge.net](http://www.sourceforge.net)). Chances are your favorite open-source project is already hosted there. Here are 10 of our favorites.

**AUDACITY** Record and edit multitrack audio. We use it to create custom ringtones and record our musical side-projects, but the possibilities are limitless.

**7-ZIP** All-in-one file archiver/unzipper. Archive and unpack in multiple formats; even create encrypted archives. One of our essential apps.

**XBMC** Lightweight home theater PC interface. Plays virtually every format, and supports streaming over your home network.

**KEEPASS** Secure password management. Create strong unique

passwords for all your web logins and access them via a master key.

**NOTEPAD++** One of our favorite text editors. If you hand-code, you'll find its support for syntax highlighting, auto-indenting, and regexp invaluable.

**LAUNCHY** Launch your programs with just a few keystrokes.

**PIDGIN** Free lightweight multiprotocol IM client.

**FILEZILLA** Sometimes you just need a fast, lightweight FTP client.

**FFDSHOW-TRYOUT** The ultimate codec pack. Encode and decode practically any video or audio file. Accept no imitators.

**SYNERGY** Control multiple computers with the same keyboard and mouse.



## PRODUCTIVITY

## Get a Keyless Virtual Sandbox

All nerds know that virtual machines make great testing environments, but not everyone has a spare Windows XP or Vista key on hand to legally create a Microsoft-based sandbox. Fortunately, Microsoft makes virtual hard drives available for testing Internet Explorer compatibility. Just search Microsoft.com for "Internet Explorer Application Compatibility VPC Image" and you can access full builds of Vista or XP to build your sandbox. The catch is that they're time-limited to a few months—but hey, considering the price, that ain't bad.

## Find out What That Font Is

In days of yore, font-recognition software was expensive and didn't work particularly well. Lucky for us, what once cost a lot of money is now available free on the web. Point your browser to WhatTheFont (<http://bit.ly/31BTHN>), upload an image featuring the font in question, and the service will give you a list of matching fonts, usually including some free options. For bonus points, font nerds can test their knowledge by trying to identify the difference between Arial and Helvetica in common logos (<http://bit.ly/RtsU8>).



## Feed Your Brain

Your noggin is never too full for more knowledge, and iTunes U—an education-oriented subset of Apple's iTunes Store—makes it free, easy, and convenient for you to continually learn more stuff. With a vast offering of digital lessons, lectures, and events from premiere universities and institutions such as MIT, Oxford, the Metropolitan Museum of Art, and others, iTunes U is a valuable resource for any hungry mind.



## EDIT YOUR YOUTUBE VIDEO

Your shaky cell-phone video of your best friend getting Tasered by mall cops has a good chance of going viral, but you can give it an extra push with some skillful editing. Fortunately, Pinnacle's VideoSpin ([www.videospin.com](http://www.videospin.com)) gets your YouTube career on track without digging into your wallet.



You can even use advanced codecs for 14 days for free on your video edits. Once the codec trial is over, you can still work in other formats, like AVI, and then use HandBrake (see below) to create an MP4.

## Shrinky Dink Your Videos

One of the fastest and best ways to convert your video files for consumption on more-portable MPEG-4-friendly devices is HandBrake (<http://handbrake.fr/>). Originally started as a BeOS project, this encoder has jumped to the front of the line when it comes to ease of use and output quality. Heck, you can even use it to convert your Pinnacle VideoSpin projects from AVI to MPEG-4.



## Sketch, Draw, and Paint

Let's face it, the vast majority of us don't need Photoshop. Sure, Adobe's image-editing program is the de facto standard among graphic designers, but for basic image manipulation—cropping, resizing, and even minor touch-ups—freeware tools do the job just fine. Over the past 10 years, GIMP ([www.gimp.org](http://www.gimp.org)) has emerged as the most worthy alternative to Photoshop. The latest version, 2.6, is packed with features for most of your digital retouching needs, and the program doesn't have a steep learning curve.

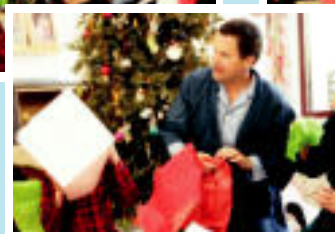
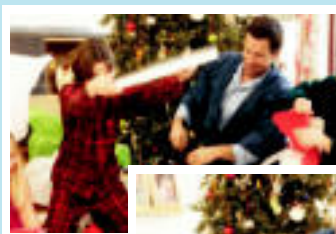


## Give MS Office the Boot

The reign of Microsoft Office may soon be over, with more productivity suites moving to the cloud. Both Google and Zoho ([www.zoho.com](http://www.zoho.com)) offer a wide range of editing services that'll let you draft documents, create spreadsheets, and even make presentations on the web. Zoho's Writer service is a powerful word processor that supports a wide range of document formats. And with Google Gears (<http://gears.google.com>) installed, you don't even have to be connected to the Internet to use it.

## Manage Your Photos

Photoshop Lightroom costs \$300 and Photoshop Elements costs \$100, but you don't need to spend big bucks to handle basic photo-management tasks—Google's Picasa (<http://picasa.google.com>) is free! Not only does Picasa index your photos, allowing you to tag and organize your snaps, it now also includes facial recognition, to make tagging all those pics of your Auntie Mabel a little less painful. But wait, there's more! Also included is free online photo storage for 1GB of your pics!



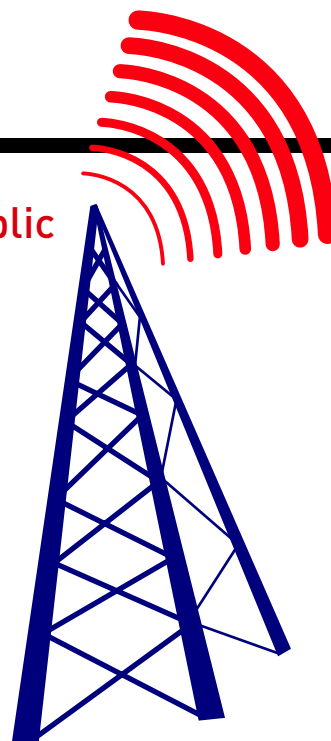
## COMMUNICATIONS

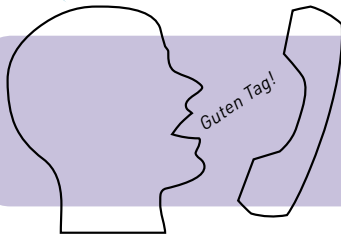
### Send Text Messages to Your Friends

Need to send a text in a pinch, but don't have the 20 cents? Luckily for you, there are plenty of sites offering to send SMS messages, free of charge, from your web browser. For instance, from the aptly named Free SMS (<http://sms.dynadel.com>), you can send free texts to any cell phone, as long as you know the number and carrier. As an added bonus, the site is formatted to be easily viewable on a mobile browser, so you can use it from anywhere.

### Leech Wi-Fi in Public

For techies, Wi-Fi access isn't just a privilege, it's a right. Too bad not everyone agrees. But you can still find plenty of coffee shops and stores that offer free wireless Internet access. Check the Wi-Fi FreeSpot Directory ([www.wififreespot.com](http://www.wififreespot.com)) for a listing of verified public hotspots all over the United States, so you'll never have to walk into an Apple store for your Wi-Fi fix.





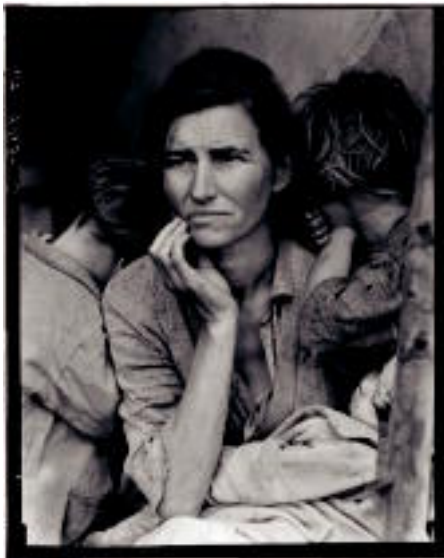
## Call the Old Country at Zero Cost

The dime lady must be pulling her hair out. Skype ([www.skype.com](http://www.skype.com)) lets you make free VoIP calls to anyone else in the world using the program; Google Voice (<http://voice.google.com>) is a free service that will let you make calls and send texts to any number in the United States or Canada (as long as you have an existing telephone number).

### CONTENT

## Access the Library of Congress Image Archive

The Library of Congress is the steward of millions of historically and culturally significant public domain images, and thanks to the LoC's Prints and Photographs Online Catalog (<http://bit.ly/9d2GI>), you can peruse about 75 percent of the Library's holdings, many of which are available for download. Not all the images are available in high res, and it can take a little time to get a feel for finding things, but it's a treasure trove for photography buffs.



## Make Beautiful Music

Learn how to play the music of the classical masters by downloading sheet music from the likes of Beethoven, Haydn, Handel, and Liszt at [Freesheetmusic.net](http://Freesheetmusic.net). The site also offers sheet music for numerous folk songs, tablature for various instruments, Midi files so you can hear many of the compositions performed, and articles geared toward the budding musician.



## Find Fair Use Photos for Your Blog

Need an image you can legally use for an art or commercial project but don't want to pay for stock photos? Flickr ([www.flickr.com](http://www.flickr.com)) lets you filter search results for photos with permissive Creative Commons licensing, so you can reuse images for your projects, guilt-free. Yahoo (which owns Flickr) has even more expansive search options in its primary image search site (<http://images.search.yahoo.com>) if you want to fish for just high-resolution or black-and-white pictures.

## Rely on the Kindness of Strangers

You have a stack of old Bee Gees records you don't want, but nobody will buy. You really need an IDE hard drive (for some reason).

Solve both of your problems without spending cash: Sign up for your local Freecycle group (find yours at [www.freecycle.org](http://www.freecycle.org))

and you'll be put on an email list you can use to give away things you don't need, request stuff you do need, and see what other people are getting rid of. The only catch is that everything has to be free—no buying, selling, or trading.



## Find the Hot Deals First

Like just about everything else, being a cheapskate has become a community activity, thanks to the Internet. Sites like FatWallet.com and SlickDeals.net are best known for highlighting steep savings with online promotions, but both also have forums where penny-pinchers share their finds as well as boards dedicated to the pursuit of zero-dollar bargains ([bit.ly/BdVsW](http://bit.ly/BdVsW) and [bit.ly/QUNNC](http://bit.ly/QUNNC), respectively), so hit them up and see what you can snag. [www.wififreespot.com](http://www.wififreespot.com)

## Embrace Craigslist

When it comes to free goods of questionable cleanliness, it's pretty much impossible to beat Craigslist. Though famous for apartment-hunting, selling stuff locally, and prostitution, Craigslist also maintains a "free stuff" board, where people give away everything from books to hot tubs to landscaping materials. Sure, a lot of it's junk, but if you keep an eye out, you might find something good. Speaking of which, if you want to be the first to swoop in on the best deals, try adding the "free stuff" board to your RSS reader.

### FREE CLOTHES IN BAG (sunset / parkside)

Time: 2:00 - 4:00 PM

Reply to: [Respond](#)

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## BECAUSE WE DESERVE IT

# Free Stuff from Microsoft

### GET WINDOWS AND OFFICE

Like many companies, Microsoft frequently runs programs to collect marketing data about how consumers use its products. Unlike many companies, Microsoft rewards participants in these programs with free copies of its most popular software—Office and Windows. There are programs running all the time, and they're usually announced at either the Windows blog (<http://windowsteamblog.com>) or at Microsoft Connect (<http://connect.microsoft.com>).

### PROTECT YOUR PC

Windows doesn't come with antivirus software, a point Apple ads endlessly harp on. But you don't need to pony up for a \$70 anti-virus suite to keep yourself secure. Microsoft has just released (finally!) Windows Security Essentials ([www.microsoft.com/](http://www.microsoft.com/)

[Security\\_essentials](#)), its free antivirus/antimalware app. It offers decent protection, and it's not bloated like some other free anti-virus programs, nor will it nag you to death. The catch? You need a legit copy of Windows. Which you have, of course.

### DOWNLOAD FREE WINDOWS UTILITIES

If you're still using XP but want some of the features of Vista and 7 (like Desktop Search), you need to check out all the OS enhancements Microsoft offers for free—we're talking more than 150 free programs, including Power Toy tools, tweaking utilities, and other goodies that aren't just intended for IT professionals. Find a complete list of these downloads at <http://bit.ly/sixLh>.





## Use Twitter to Your Advantage

Twitter feeds like @freestuffus post links daily offering free samples, money-saving coupons, and trade magazine subscriptions. An alternative is Freezly.com, which actually aggregates tweets from public feeds that broadcast contests and free giveaways.



## LEGALLY SNEAK INTO MOVIE SCREENINGS

Listen up, pirates. There's no need to download movies when you can legally watch them in the theater for free. Studios often offer free movie screenings to help promote upcoming films, and you can reserve your seat at these sneak peeks online at Film Metro ([www.filmmetro.com](http://www.filmmetro.com)) and Gofobo ([www.gofobo.com](http://www.gofobo.com)). Marketers also often leave screening passes at local record shops and university campuses. You can have your cinema cake and eat it, too.

## See the World

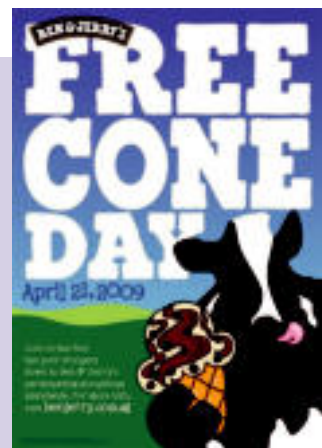
Unless you plan on hitchhiking your way through the Sahara Desert, traveling to far-off places can cost more than you'd bargained for. And for last-minute trips, a room at a hostel or hotel can be hard to come by. Why not meet new people and see the world by couch surfing?

At Couchsurfing.com you can make connections with other travelers as well as folks willing to let travelers crash on their couch. Additionally, there's a vouching system that lets members declare their trust for other members, thus taking some of the worry out of sleeping on a stranger's sofa.



## MAKE ANOTHER MAN'S TRASH YOUR TREASURE

Sure, it's not the most glamorous pastime out there, but there are a lot of goodies to be found in the world's garbage cans. Grocery stores and bakeries frequently throw out still-good food, and book stores discard old magazines (the trick is just figuring out where). For links to blogs about dumpster diving, hit up [Freegan.info](http://Freegan.info).



## Nourish Your Sweet Tooth

A Slurpee costs around a buck, but it's even sweeter when you can get it for free. 7-Eleven runs a promotion to give away its sugary beverage every July 11, and other franchises have similar free days, as well. Ben & Jerry's has its Free Cone Day every April, and Krispy Kreme has been known to hand out free doughnuts on National Doughnut Day—the first Friday of June.

## Get Your Indie Game Fix

The advent of digital distribution has let independent game developers compete with AAA studios for audience attention. [Indiegames.com](http://Indiegames.com) is one of the best ways to keep tabs on upcoming indie games and their developers, plus find scads of freeware, demos, and fun browser games.

## Play Free AAA Games

Though they might not have had great retail success, some high-profile games have been reborn as free-to-play online games. Two of our favorites are *Battleforge* ([www.battleforge.com](http://www.battleforge.com)), a real-time strategizer with a collectible card game twist, and *D&D Online* ([www.ddo.com](http://www.ddo.com)), the MMO reimagining of the tabletop classic. Both are free to play, although the publishers will happily take your cash in exchange for more features or upgrades.



## Free Plants vs. Zombies

A free Flash version of *Plants vs. Zombies* ([www.popcap.com/games/free/pvz](http://www.popcap.com/games/free/pvz)) will certainly ensure that you never get any work done. The web version isn't as fully equipped as the paid version, but it does include three kinds of gameplay, 14 different levels to conquer, and 12 types of plants to defend with, as well as the engaging soundtrack that's sure to be ingrained in your memory for months.



## Play Multiplayer Shooters

In the last year, two very different but nonetheless compelling shooters have been released as free-to-play web games. *Battlefield Heroes* ([www.battlefieldheroes.com](http://www.battlefieldheroes.com)) strips out everything but the core gameplay mechanic from *Battlefield: 1942* and packages the whole game in a browser-based third-person shooter. At the same time, *Quake Live* ([www.quakelive.com](http://www.quakelive.com)) packs much of the original *Quake 3 Arena* experience into an ad-supported, web-based version of the game. Getting online in either game is as easy as downloading a plugin for your browser and clicking Play Now. ⏻

## Discover Amazing Web Games!

Whether you're looking for a little lunchtime zombie-killing or just a good game of rummy, you can find it at [Kongregate.com](http://Kongregate.com). Unlike other web-game portals that are simply frames around the same Flash games you see everywhere, Kongregate adds modern features like game-specific chat and achievements to keep you coming back for more. Our favorites at Kongregate? *Fantastic Contraption* (<http://bit.ly/17DFRu>), *Multitask* (<http://bit.ly/15E2Di>), and *Shopping Cart Hero* (<http://bit.ly/1UzGVN>).

### FREE OR FEE?

## Incredible Offers You CAN Refuse

Cell phone carriers like Verizon are offering "discounted" netbooks when you sign up for a data plan. OK, \$150 for a netbook that's listed at \$600? That's damned-near free, right? Frankly, no. The first catch is obvious: The list price is wildly inflated. Based on specs, the majority of these netbooks would sell for \$400 at best—some would even fall into the \$350 range. Now consider that to get the netbook you have to sign a two-year contract, committing to a monthly charge of either \$40 for a pathetic 250MB or \$60 for 5GB of data. That's either \$960 or \$1,440 over the life of the contract. For the vast majority of us who already pay for broadband at home, it just doesn't make a lick of sense to shell out for another data plan to save \$200 on a netbook.

Another bogus offer on the Internet is the "free" business card. Sure the cards are free, but you'll have to pay \$10 to get those 250 business cards delivered to you. Even if you're willing to pay for the shipping and handling, you still have to run a gauntlet of other impulse items before you can check out.

The final gotcha that most folks know to avoid is the rebate. Why do stores even offer rebates when they seem to provoke so much animosity from consumers? Statistics show the vast majority of us are too lazy to fill out and mail the rebate forms. And when we do, we have a better chance of winning the Lotto than ever actually receiving the rebate check.

# FROM PIXELS TO PRINT

Photography has gone digital, but the need for printed photos still exists. We search out the best way to make hard copies of your digital pics BY LOYD CASE

Printing digital photographs seems so last century.

These days, we all carry at least one smart device, whether it's an iPhone, a Zune, an MID, or something else. We all use Facebook. And those with a more serious photographic bent might also use an online photo service like Flickr or SmugMug. Indeed, a vast array of methods for showing off your photography without actually handing someone a print now exists.

There are good reasons, however, to have photographic prints—even in the 21st century. Grandparents and other family members often like to have something to put in a frame that they can hang on a wall. Another other reason is size. There's something compelling about a really large print—8x10 inches or beyond. An iPod or laptop screen might be an acceptable replacement for the common 4x6- or even 5x7-inch print. But holding up a 13x19-inch print suddenly makes a half-decent photograph seem almost like a work of art.

So, for those times when you want a print, what's the best way to get it? Is it worth paying \$400 or more for a large-format printer, and then paying again and again for the ink? What about large-volume or professional online photo-printing services? Are they cost-effective, and can those prints measure up to a good-quality home printer? And how about those photo kiosks you find in places like Target and many grocery stores?

On the following pages, we'll take a look at the various methods for putting that hard-copy photo print in your hands. We'll look at variations in color fidelity, the overall cost, and take a stab at trying to understand how well the prints last over time.





# YOUR PRINTING OPTIONS: AN OVERVIEW

Today, you have a plethora of printing choices. Photo-quality inkjet technology has become substantially better, with longer-lasting, pigment-based inks. Online photo printing services have sprouted like virtual weeds. Photo-printing kiosks can be found in stores and shopping centers. Even entry-level inkjet printers can dash off quick, small prints, if you don't need permanence.

## HOME PRINTERS

These days, all-in-ones—those devices with a built-in scanner, color printer, and possibly a fax machine—often cost no more than a dedicated inkjet printer. Many of these offer wireless or wired network connections. If you don't need prints larger than 8x10, and can use a scanner for either faxing or scanning photos into your PC, an all-in-one can be worth considering.

Moving up the scale a bit are the relatively affordable, large-format printers. These can print at sizes up to 13x19 inches. HP offers an entry model for less than \$150 (after a \$150 rebate), with prices going up to around \$650 for the higher-end, professional model. Canon offers a pair of models ranging from \$500 to \$900. Epson offers the widest range of products, from \$250 to \$995.

## RETAIL CHAINS

Big-box stores like Target, Wal-Mart, and Costco offer online printing services. You can order your prints and either have them shipped to you or ready for pickup at the nearest retail outlet. The prices are relatively affordable—about on par with the consumer-oriented online services.

## ONLINE PHOTO-PRINTING SERVICES

Online photo-sharing, popularized by sites like Flickr and SmugMug, offer printing services, though the actual printing is often handled by a third party. For example, if you're a Flickr user and want to order prints, Flickr redirects you to Qoop.com.

Facebook is the single largest online photo-sharing service, due to its huge user base, but there's currently no way to order prints from Facebook's default photo album. You can install a Facebook app like Photobox, which allows you to order prints, but then you have the annoyance of managing a separate Facebook app.

There are also a number of dedicated online printing sites if you just want to print photos you have stored on your PC. Examples include HP's Snapfish, Shutterfly, Kodak Gallery, and PhotoDirect. They

all offer relatively low prices and subsidiary services, like online photo albums, custom framing, and related products.

## PROFESSIONAL PHOTO PRINTING

Online printing services are available for more professional needs. One example is PhotoWorks, which offers custom printing services for many pro photo shops. The quality of these prints may be a notch above the typical volume online service. For more discriminating pros, localized companies like San Francisco's Dickerman Prints ([www.robyncolor.com](http://www.robyncolor.com)) can be found in larger cities. You can upload your photos there, or even bring them into the local office and manually manage the printing yourself.

## PHOTO PRINTING KIOSKS

If you wander into any Target store, you can usually find a Kodak printing kiosk. Other companies, like Fuji, HP, and Epson either have their own kiosk hardware or supply to kiosk manufacturers. The kiosk consists of a dedicated PC embedded in a cabinet with a touch screen and photo-printing hardware. Pictures uploaded from a memory card or CD are printed in less than a minute.

## HOW IT WORKS

# The Technology of Photo Printing

The technology for actually putting that photo to paper differs substantially between inkjet printers and online photo-printing services. Inkjet heads, whether built into disposable ink cartridges, as with HP printers, or separate and replaceable, as with some Canon printers, are actually built in semiconductor plants using older, low-density manufacturing processes. The etching and lithography are necessary to create the hundreds of tiny nozzles and channels which route the ink to the paper.

An inkjet printer works by running current through an extremely tiny, heated chamber that boils the ink and forces it out the print nozzle. That's the easy part. The hard part is managing millions of tiny droplets and putting them on paper in precise order. The type of inks that go into inkjet printers have evolved over the years, with modern photo-quality inkjet printers using pigment-based inks with preservatives that help

the ink last longer and resist fading.

A step up from home inkjet printers are those used in photo kiosks. A kiosk can use high-volume inkjet printers or dye-sublimation printers. Dye-sublimation printers actually use ribbons that are heated until the dye becomes a gas that is then transferred to the paper. Fuji offers a line of inkjet-based kiosks, while the Kodak kiosk we used in our testing uses a dye-sublimation technique.

The technology used by the online printing services is similar to the photographic process used for color printing in the past. Chemically treated paper is exposed to light, then processed chemically to stabilize the print. Paper is usually fed in large rolls, then prints are cut at the end. The higher-volume printers use RGB lasers to print the image directly to paper, which allows more precise control.

# Getting the Picture

## We compare eight popular photo-printing solutions

As it turns out, there's no universally perfect printing service. The output quality varies, as does the cost per print. We took a look at a number of different printing options, and found both good and bad with each service.

We tested as if we were requesting casual prints to hand out to friends or family. Even when we printed to a locally attached photo printer, we used quick print methods, deliberately

avoiding careful color matching or tuning of printer driver profiles. The idea was to evaluate the experience of a typical casual user. Of course, if you're dropping \$500 or more for a professional quality printer, you might want to calibrate the printer to the display. Even then, there are times when you'd want just a quick print.

We either uploaded or printed the same eight test images, which included

a variety of indoor and outdoor scenes, plus one test image we found on Inkjetart.com. We opted to print at 5x7 inches rather than the common 4x6-inch default. This allowed us to explore the user interfaces of the services and quick-print options a bit more than if we simply clicked through the defaults. Here's how we ranked eight competing methods from worst to best user experience.

### THE KODAK KIOSK

Despite being able to walk in, plug in your own memory card, and get a print in a few minutes, kiosks aren't very effective. Also, you can't rely on them being in working condition—we encountered one drugstore kiosk that was either turned off or disconnected from power.

The Kodak kiosk we used let us print 5x7-inch prints, but the user interface was clunky at best. Trying to print to a size other than 4x6 meant re-selecting each picture and setting the size. We couldn't find a "print all photos at this size" option. On top of that, the photos were actually printed on paper larger than 5x7, requiring a manual trim if we had wanted to put them in a frame.

All that effort resulted in the worst output quality of any of the photo-printing methods. Colors didn't seem true and highlights were blown out, resulting in detail loss in bright parts of a scene. Indoor scenes fared a bit better than outdoor.

On top of the flaws, printing at the kiosk cost \$1.49 per print, or \$13.02 for all eight including tax—more expensive than three of the online services.

**PROS** Walk in with your memory card and print.

**CONS** Print quality varies widely from one location to the next.

#### VERDICT



The highlights are blown out in the Kodak kiosk print, giving the image a washed-out look and losing detail in the wall, compared to the reference picture above.



## FLICKR / QOOP

Once we got past the photo kiosk, the overall quality of all the printing methods improved substantially. There were subtle but noticeable differences in color balance, but when viewed independently, most of the prints looked good to the eye. Still, we're ranking Qoop, Flickr's integrated photo-printing service, toward the bottom of the pack because of an oddity in aspect ratio.

When you print a photo, the services typically try to judge what part of the image to print to fit the size you've requested, and most will crop your image accordingly. (Note: If you've cropped the image yourself, then the final print may not reflect the framing you're trying to achieve.) Good or bad, that's what you expect to get when you order a borderless image.

Qoop just printed the whole image in two of our test cases, rather than auto-cropping—but in the wrong orientation. So an image that should be tall (portrait) ended up landscape. To be fair, most of the online services and the HP printer soft-



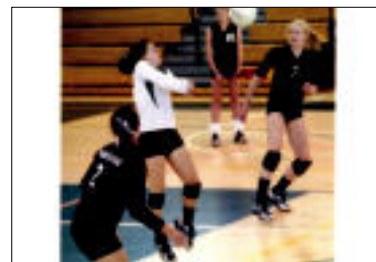
VERDICT

ware made the same mistake with the image orientation, but they at least cropped the image in a fairly smart way to fill the paper. The effect in those cases was similar to a close-up crop. The Qoop service just printed the whole picture in landscape mode. The result: large white bars on either side of the image.

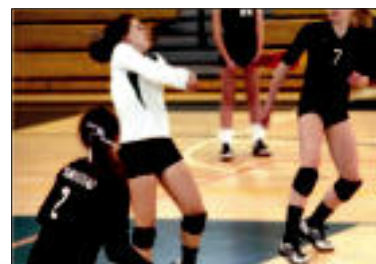
Other minor nits: The contrast levels seemed a bit on the high side, resulting in some minor loss of detail in dark parts of a sunlit image, but this wasn't noticeable unless you compared the output to an identical image from a different source.

Flickr has partnered with the Picnik online editing site to allow fairly sophisticated image editing prior to printing. But it's not well-integrated with the printing service.

Printing from Flickr is a little on the pricey side for online printing; our eight 5x7 images cost \$14.06, including shipping and tax, for normal delivery. You can order large-format prints—up to 20x30 inches; a 20x30 print costs \$23.



**While you could argue that the Qoop image (above) shows more of the photo, when you order borderless, you expect borderless.**



**PROS** Flickr's capabilities for photo sharing and storage are terrific.

**CONS** The Flickr/Qoop integration is pretty limited.

## PHOTOWORKS / KEEBLE & SHUCHAT

Keeble & Shuchat is a photographic gear reseller in Palo Alto, CA, selling to both professionals and amateurs. K&S uses a customized version of PhotoWorks called Photofinale as its online printing partner.

Overall image quality was solid, with good detail levels and color balance. But the price was steep. Printing eight 5x7 images cost \$39.33—\$4.50 per print plus tax—whereas other online print services charged \$9–\$14 for the same set of prints. So what makes ordering from Keeble & Shuchat cost so much more? It's the ability to tweak your photos online before printing. Photofinale includes the Picnik online photo-editing tool as part of the service. It's fully integrated into Photofinale, making for a complete solution. The only thing you can't do is print a proof before the final order.

So while \$4.50 for a 5x7 print seems steep, what you get is the ability to



VERDICT



**Keeble & Shuchat's Photofinale combines the PhotoWorks online printing service with the Picnik online photo editor, creating an integrated online package for tweaking photos before printing.**

customize the output before you buy the print rather than relying on some automated print service guessing at the best settings.

**PROS** Good integration with Picnik online editing tools.

**CONS** Way too expensive.

## HP PHOTOSMART C309a

This printer—also sold as the HP Photosmart Premium Fax All-in-One—uses five ink cartridges: black, photo black, cyan, magenta, and yellow. It happens to be the exact same cartridge set used in HP's entry-level large-format printer, the Photosmart B8550. So, we expected good image quality.

Overall, indoor scenes and scenes with people looked quite good. Flesh tones looked natural and pleasing. Our bright, sunlit scene demonstrated slight loss of detail in the reflections and water, but the overall image quality seemed fine.

However, this printer exhibits some odd behavior when not printing. Once or twice a day, the printer would come to life, quite noisily, grinding away as if about to print something. Perhaps the unit was priming the print head, or performing some other routine automatic maintenance, but when this happened it was very distracting. And although printing multiple pages seemed speedy



enough, the time to print the first page, particularly for mixed graphics and text, seemed extraordinarily long.

By far the worst problem, though, is HP's software. The printer driver settings page is confusing and the user interface obtuse. The scanning software is very slow, even though the actual physical scanning speed is fairly fast.

The Photosmart C309a retails for \$200, but you can find it for \$150 if you shop around. A set of XL-size 564 cartridges costs \$65 and should generate about 200 5x7 images. A package of 5x7-inch paper (60 count) runs about \$12.50. That amounts to about 53 cents per print—or \$4.24 for our eight test prints. That's a good deal, assuming you print enough to amortize the initial cost of the printer.



**HP's C309a is a good printer marred by a poor software interface.**

**PROS** Good image quality for a low-cost device.

**CONS** Printer is occasionally glitchy. Software UI is poor.

## SNAPFISH

Snapfish is owned by Hewlett-Packard, allowing the company to generate revenue even if you're not printing on an HP printer. Snapfish's cost for printing our set of eight 5x7 prints totaled \$11.43, about middle of the road for the online services we tested.



**With Snapfish, you can print photos directly from Facebook.**

Snapfish is all about photos. The site makes a few nods toward social networking, mostly by allowing you to create shared groups and friends lists. You can also post photos directly to Facebook, TypePad, MySpace, and



Blogger. Rudimentary editing capabilities are available, but they're limited to simple auto-correction, cropping, and red-eye removal. You can also add borders or create monochromatic images. You can crop and edit the photo size to fit your print aspect ratio, but that feature is hidden within the "fix and enhance" part of the edit menu—which itself isn't easy to find.

On the flip side, Snapfish recently added the

capability (still in beta) to print photos from your Facebook photo albums. The photos are somewhat limited in resolution, but it's convenient to be able to order prints directly through your Facebook interface.

Image quality of our reference prints generally seemed good—much better than the Kodak photo kiosk. We noticed slight color variations among all the online services, but no glaring defects. The default ordering menu specifies sizes up to 8x10; you need to go to the "poster prints" page to order images up to 20x30 inches. A 20x30 print costs \$20.

**PROS** Relatively low cost; easy to use.

**CONS** Limited editing.

## SHUTTERFLY

Shutterfly offers a slick, if somewhat cluttered interface for its web ordering system. You can order photos, photo books, calendars, photo mugs, and other related items. Shutterfly also offers some simple social-networking services, like



Shutterfly's print preview lets you visualize exactly what part of the image will be printed.

the sharing of online albums and tagging of photographs. You can even right-click an image and upload it directly to Facebook.

Files are managed in photo albums, and the photo albums show up in a Windows Explorer-style side pane—it's a very Web 2.0-style interface. Shutterfly recently added an iPhone app, so you can show your photo albums when on the go.

Editing is limited to simple auto-fixes (e.g., red-eye removal), but you get a fair amount of control over which parts of the image you want to print.

### VERDICT



You can specify an aspect ratio (e.g., 5x7), and then adjust the size and cropping to best suit your aesthetic tastes. There's even a slick print preview.

Image quality of our eight images was actually pretty good—substantially better than our kiosk experience and generally better than one-hour print services we've used in the past.

Our reference eight-photo order cost \$8.91, including shipping, making Shutterfly one of the most cost-effective online printing solutions. You can order prints up to 20x30 inches, although a 20x30 print will set you back a hefty \$22.99.

**PROS** Lowest cost of the services we tested; good social-network integration.

**CONS** User interface is cluttered.

## COSTCO

Costco, the big-box, membership-based retailer, offers photo-printing services to its members. Our eight-print sample album cost \$10.49 to print. The photo-printing site offers a clean, somewhat sparse user interface that's extremely simple to navigate. In fact, the Costco site was probably the easiest to navigate, although it offers little in the way of social networking beyond simple group albums and email sharing.

As with Snapfish, Costco does offer some rudimentary editing capabilities, limited to the standard red-eye, auto-correct, and fill-flash types of options. Cropping is perhaps the best part—you can crop to specific sizes and aspect ratios, making it possible to print the parts of the image you'd like to see on the photo. Compared with the other consumer online services we tested (Snapfish and

Shutterfly), Costco's manual cropping control was the easiest. Flickr and Photofinale required

### VERDICT



you to use the somewhat more complex Picnik editor to handle detailed cropping.



Costco's photo-printing site makes it very easy to crop an image to fit a specific aspect ratios.

**PROS** Very easy to use; cropping options.

**CONS** You have to join a big-box retail club.

## CANON PIXMA PRO9000 MARK II

The Pixma Pro9000 Mark II is the lowest-priced of Canon's big Kahuna 13x19-inch printers. Canon's retail price is \$500, but you can typically find it for between \$400 and \$499 online. As with all inkjet printers, what you really pay for is ink. However, we were pleasantly surprised to find that we were able to print out eight 5x7-inch prints plus about 15 13x19-inch full-color photos without draining any of the original ink cartridges. That's encouraging, since a Pixma Pro9000 eight-pack of ink is about \$85. (The Pixma Pro9000 uses eight colors: black, cyan, magenta, yellow, photo cyan, photo magenta, red, and green.) Individual ink cartridges cost about \$11 each, so buying individual cartridges when you need them isn't such a bad deal. The cost of ink isn't the only expense: a 20-pack of good-quality 13x19-inch paper will cost you about \$15–\$20. Given the number of 13x19 prints we created without running out of ink, this is likely to be a pretty cost-effective printer on the ink side. You

### VERDICT



should expect about a \$3–\$4 cost per large-format print; users have reported getting a maximum of about 40 13x19 prints from a cartridge set, although individual color usage may differ depending on the type of photography.

On the other hand, the output is gorgeous. Color rendition looked accurate and detail levels were good—and these were just automated quick prints using Canon's own print software, not calibrated. One good thing about Canon's print software is that it made a good guess with one of our photos, and printed a shot in portrait mode, yielding a better composition than all the other printing services and even HP's printing software for the C309a.

Of course, you're paying a lot more for the Pixma Pro9000 II, so the output had better be outstanding.



**Canon's Pixma Pro9000 Mark II offers exceptional color print quality and large-format prints up to 13x19 inches.**

**PROS** Excellent output quality; high ink capacity.

**CONS** It's 500 bucks, and large-format paper costs a bundle.

## The Bottom Line

If you print photos rarely, the online photo services have come a long way. About the only downside is that you'll have to wait for shipment. It was interesting to note that services like Shutterfly and Costco generated

prints every bit as good as the PhotoWorks service used by some pro shops, and for a lot less money.

If you really care about the quality of your prints, and are willing to take the time

to calibrate your output to your display, having a good printer is the only way to go—assuming you print enough to offset the cost of the printer itself. What you get is incomparable control and convenience. ☺

### TORTURE TESTING

## Your Prints vs. the Elements

In the past, inkjet printers were known for printing photos that fade over time. In fact, early inkjet prints would fade after just a few months, even if tucked away in an album. If you mounted a print in a frame and left it on a table, you'd actually see uneven fading, depending on how light shined on the glass.

We couldn't let our test pictures sit around for several years to test their relative permanence, but we could expose them all to the northern California sun. We placed identical test images from all the services we reviewed in identical 5x7 wood-and-glass frames.

We then exposed them to 13 days of sunlight, outside, on a white concrete patio. (The test would have been a full two weeks, except it did rain one day.)

Every few hours, we'd go out and shift the orientation of the table to maximize the pictures' exposure to the moving sun.

We were pleasantly surprised to find that none of the images demonstrated any serious fading. Of course, that doesn't mean the pictures will be durable over many years. But short-term image fading seems to be a thing of the past.

# Shall We Play a Game?

Put away those quarters! You can rock old-school arcade action at home! **By Alex Castle**

If you were a kid in the 1970s or 1980s, chances are good that a big part of your childhood was spent wasting quarters at the local arcade, or in front of the Pac-Man machine at your local pizza place. Sure, videogames have become a lot more complex since then, but the old titles had a lot of charm, and in some cases, a level of skill and patience-rewarding challenge that hasn't been matched since.

Sadly, the arcade is rapidly becoming a thing of the past. Now that PCs and game consoles have become so powerful, the only way for arcades to compete has been to offer games with enormous, complicated controls, which end up costing a dollar or more per play. And besides, that's only if you happen to live next to one of the very few remaining full-size arcades. For most people, the closest thing you've got to an arcade is the worn-out Initial D machine at your local multiplex.

But you can bring the classic arcade experience back to life, in your own home. With a MAME arcade machine, you and your friends can relive those glory days of yore, playing your favorite old games, using the authentic controls they were made for.

You can go all-out, as we did, and build an actual cabinet like the ones you used to actually play on, or you can simply load the appropriate software onto an old PC, snag yourself an arcade-style joystick, and begin challenging your pals to Donkey Kong in no time.

Read on to find out how.





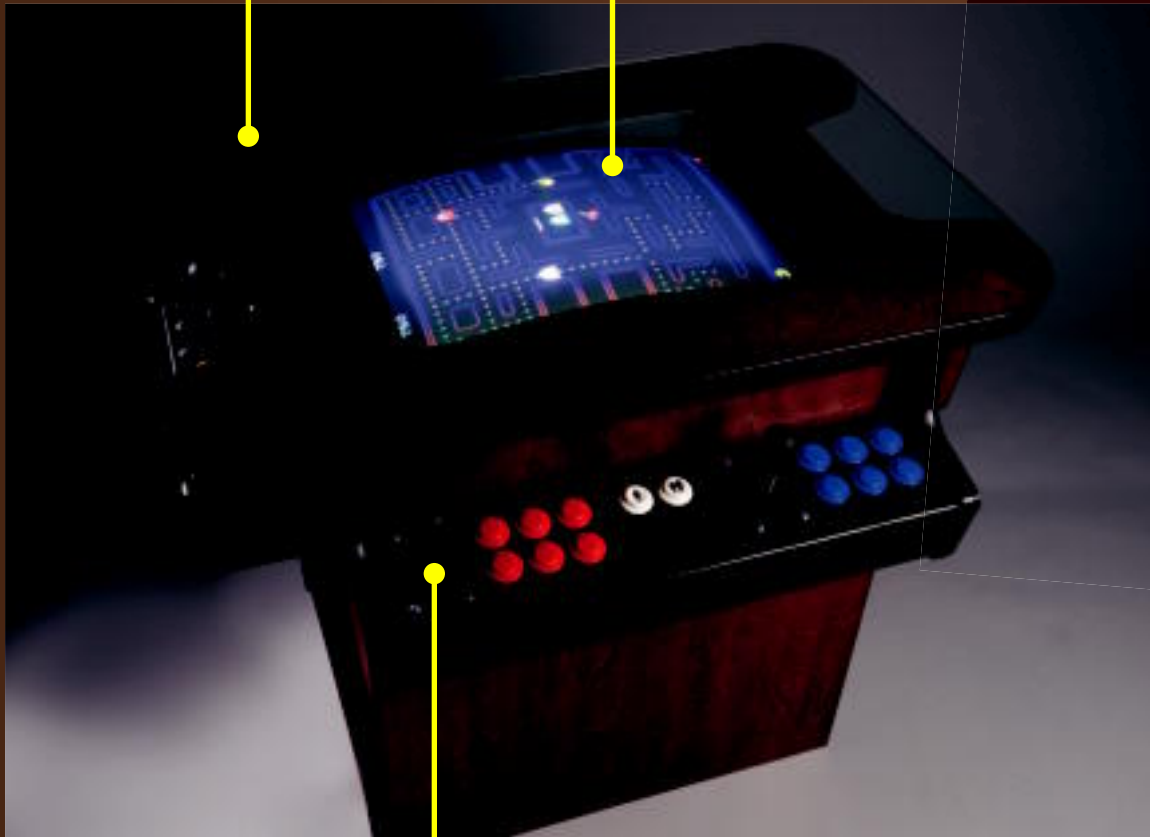


# Our DIY Cabinet Inside & Out

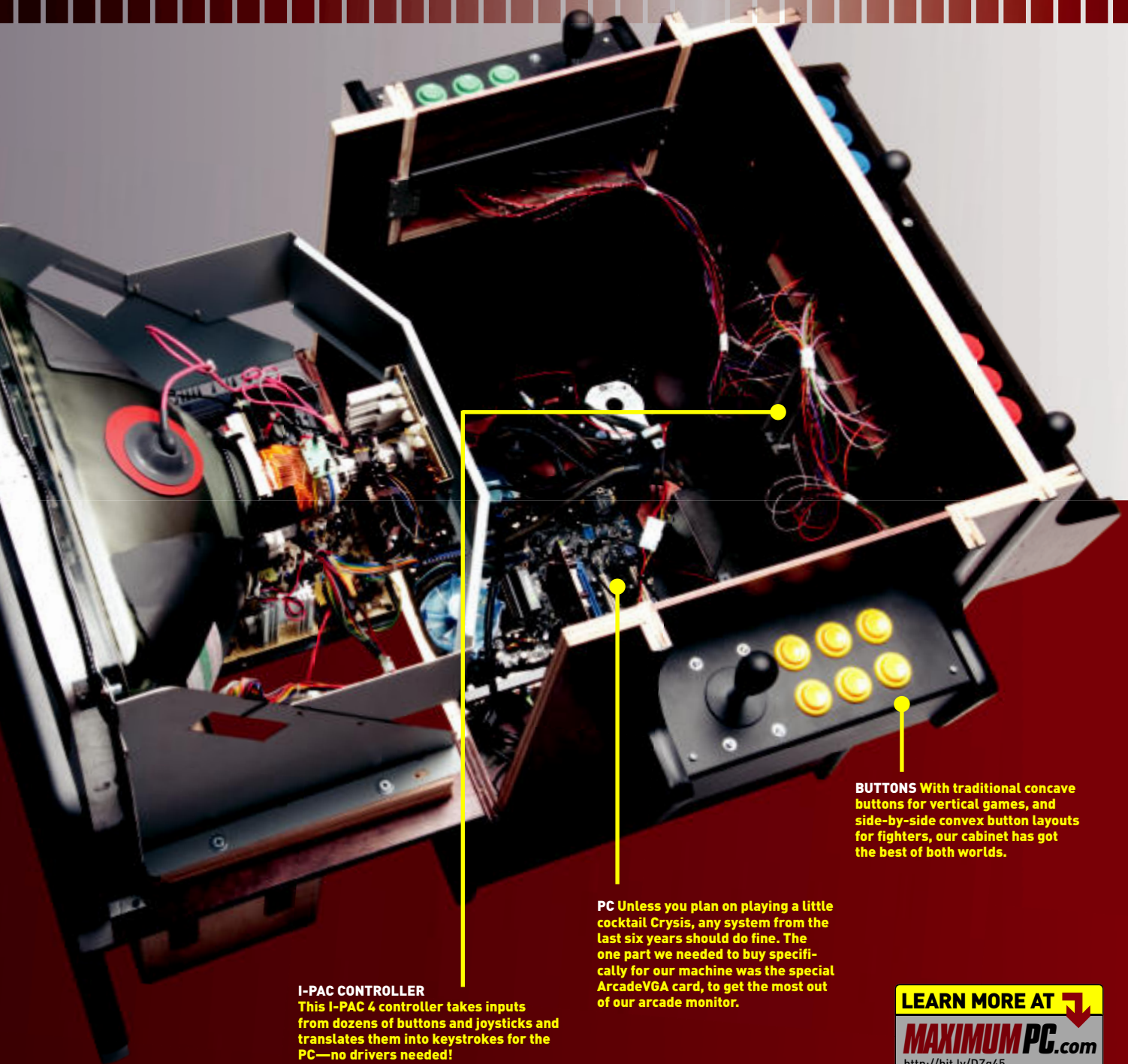
You don't need to build a cocktail-style cabinet to enjoy old-school arcade games at home, but it sure can add to the fun

**CABINET KIT** You can design and build your own cabinet if you've got the carpentry chops, but we built this beauty from a kit sold at [ArcadeDepot.com](http://ArcadeDepot.com). It's got holes for speakers and ventilation, and folds open for easy maintenance.

**MONITOR** Sure, it's big, heavy, and can give you a 20,000-volt shock, but an arcade CRT monitor is the best way to experience old games in all their pixelated glory.



**JOYSTICK** These Mag-Stick Plus joysticks can switch between four-direction and eight-direction modes, letting you play Pac-Man and Street Fighter on the same stick.



**I-PAC CONTROLLER**  
 This I-PAC 4 controller takes inputs from dozens of buttons and joysticks and translates them into keystrokes for the PC—no drivers needed!

**PC** Unless you plan on playing a little cocktail *Crysis*, any system from the last six years should do fine. The one part we needed to buy specifically for our machine was the special ArcadeVGA card, to get the most out of our arcade monitor.

**BUTTONS** With traditional concave buttons for vertical games, and side-by-side convex button layouts for fighters, our cabinet has got the best of both worlds.

LEARN MORE AT   
**MAXIMUMPC.com**  
<http://bit.ly/DZg45>

## THE PARTS LISTS

### CABINET

- MONITOR** Bilabs Autosync arcade monitor [**\$240**, [www.arcadeshop.com](http://www.arcadeshop.com)]
- CABINET** Prestained oak cabinet kit [**\$300**, [www.arcadedepot.com](http://www.arcadedepot.com)]
- GLASS** Tempered cocktail tabletop glass [**\$115**, [www.arcadedepot.com](http://www.arcadedepot.com)]
- JOYSTICKS** Ultimarc 4x Mag-Stik Plus [**\$120**, [www.ultimarc.com](http://www.ultimarc.com)]
- BUTTONS** 30x pushbutton with horizontal microswitch [**\$60**, <http://happcontrols.com>]
- KEYBOARD ENCODER** Ultimarc I-PAC 4 [**\$65**, [www.ultimarc.com](http://www.ultimarc.com)]
- VIDEOCARD** ArcadeVGA card [**\$90**, [www.ultimarc.com](http://www.ultimarc.com)]
- WIRING** Wiring kit [**\$22**, [www.ultimarc.com](http://www.ultimarc.com)]

### PC FROM SPARE PARTS

- CPU** Intel Core 2 Duo E6600
- MOTHERBOARD** EVGA nForce 680i SLI
- MEMORY** 1GB Corsair DDR2
- HDD** WD Raptor 150GB

# Set Up Your PC for Classic Gaming

With emulation software, your rig will think it's a game cabinet

Now, building an old-school custom arcade cabinet might be the best way to get your classic gaming fix, but if you don't have the time, money, or space for that kind of setup, you needn't be left out in the cold. We'll show you how to use two programs—MAME and MaLa—to turn your PC into a nostalgia powerhouse. First, here's what you'll need.

## MAME

Short for Multiple Arcade Machine Emulator, MAME ([www.mamedev.org](http://www.mamedev.org)) is a popular program that simulates the software

and hardware in thousands of old arcade games. To play a game on MAME, you'll also need a ROM of that game, which is a file containing the data dumped from that arcade machine's main board. There is a selection of obscure ROMs that have been made available for free by their copyright holders on the MAME homepage. You can also contact game companies directly about purchasing ROMs from them, although some companies are more receptive to this than others.

## MALA

Short for MAME Launcher, MaLa (<http://malafe.net>) is a "front end"—software that displays and organizes your ROMs. Although originally designed for MAME, MaLa can actually launch games with any emulator that runs from the command line, meaning that you can manage all your classic gaming from a single program.

## APC

If you're reading *Maximum PC*, it's a pretty safe bet that you own a computer. But is your PC enough of a beast to handle the awesome power of MAME? Err, yes. Since MAME mostly plays games that are at least 10 years old, pretty much any computer from the last six years or so should work just fine.

Unfortunately, there's more to getting MAME and MaLa working than just clicking on `setup.exe`. But don't worry, we're going to show you exactly how to get each program configured just the way you want it.



## GAME CONTROLLERS

# Games the Way They Were Meant to Be Played

So why do you need a game controller with your MAME machine? Simply put, because even though you can use a keyboard to play *Galaga*, it just can't match the old-school feeling of frantically thrashing a joystick back and forth and hammering on the fire button. So, for controls, you've got a few options:

**Build Your Own!** If you want complete control over your controller, your only option is to build your own from parts. You can find detailed plans and instructions on enthusiast sites like [Arcadecontrols.com](http://Arcadecontrols.com), and you can pick out exactly which inputs you want. If you're looking for a specialty controller, such as a spinner, trackball, or four-way joystick, this is the way to go.

**X-Arcade Controller** X-Arcade ([www.xgaming.com](http://www.xgaming.com)) sells a number of pre-made arcade controllers, an excellent option if you're not up for a DIY project, or if you just want to get gaming

right away. Though you can't define your own layout, X-Arcade's controllers come with enough buttons for even the most complicated games.

**Xbox 360 Controller** If you're on a tight budget, or just low on space, an Xbox 360 controller (\$40, [www.microsoft.com](http://www.microsoft.com)) will at least get you a joystick to play with. And if you play many modern games, you ought to have one anyway—these gamepads are perfect for playing games like *Batman: Arkham Asylum* and *Street Fighter IV* on the PC.

The X-Arcade Solo Joystick



## 1 INSTALL MAME

MAME has to be installed first, because MaLa configures itself based on the MAME installation. There are several different versions of MAME available, including ones with nice GUIs or additional features like video filters that simulate the look of a CRT on an LCD, but for our purposes the basic command-line MAME is sufficient.

Download MAME along with the appropriate binaries from the website. If you're running a 64-bit OS, make sure to grab the 64-bit MAME binaries. Simply run the self-extracting archive, and select the location where you want MAME installed.

You can install the program wherever you like, although we prefer to keep all of our emulation programs in one folder, such as C:/Emulators. MaLa will need to reference several files and folders within the MAME installation, so it keeps everything more organized if you've got a single hub for all of your programs.

► **Samples:** MAME strives for perfect emulation of old games, but it still has some flaws. Particularly, the sound circuits of some older games are too complicated to properly emulate, so MAME "cheats" a bit by using samples of the sounds used in the game. To make the games that use samples sound right, you'll need to populate the samples folder in the MAME directory. Samples for individual games can be found at <http://bit.ly/dDJJ4>, or you can search for a complete archive.

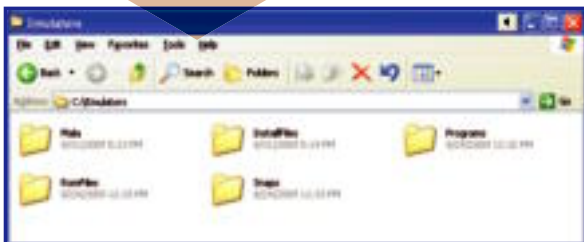
► **History.dat:** This file is an archive of information about games supported in MAME. Download it from [www.arcade-history.com](http://www.arcade-history.com) and include it in your MAME directory to allow MAME and MaLa to provide detailed information about any game in your list.

► **Catver.ini:** This file (found at <http://bit.ly/hVlvQ>) contains genre and version information about every game supported

by MAME. This information helps MaLa sort and filter your games. Put it in your MAME directory.

► **Controls.ini:** This file contains information about which controls are used by which game. It allows MaLa or other programs to filter your games so you only see games you can play with your controls. Download it at <http://bit.ly/2RkC0R> and put it in your MAME directory.

► **Additional Artwork:** This data is not necessary, but front ends like MaLa can display additional artwork, including screenshots, photos of the cabinet, flyers, and more. Most of this artwork can be found on the excellent MAMEWorld website (<http://bit.ly/O09ow>) in the Artwork section. If you would like to use any of these assets with your front end, download them, then place them in their own subfolder in the MAME folder.



## 2 DOWNLOAD ADDITIONAL MAME RESOURCES

The default MAME installation is all you need to play any ROMs located in the roms subfolder of your MAME directory. However, the main goal of the MAME project is to preserve arcade history, and to that end there are other databases and files you can download to give MAME more background info about the games you're playing. Here's a list of those files and what they do.

► **Artwork:** MAME has in-game support for bezels, backdrops, and overlays, which can give a game its original arcade flavor. These artwork files can be found for individual games at <http://bit.ly/14KIDz>, or you can search for the entire artwork.zip archive of all game art on Google. Put the game art into the artwork folder in the MAME directory, leaving it zipped in individual game packages.



### 3 CONFIGURE MAME

To configure MAME the way we want it, we'll need to edit the `mame.ini` file—but first, we'll have to create it. To do so, open a command prompt (go to Run in XP's Start menu, or Search in Vista or Win7, and type `cmd`), navigate to the folder that contains `mame.exe` (use the command `cd C:/Emulators/MAME`, if you've named your folders like we did) and then enter the command `mame -cc`.

Now you should see a `mame.ini` file in the MAME directory. Use your favorite text editor to open the file. All of the settings in the file are pretty self-explanatory, but here's a couple of useful ones: Under the Core Artwork Options heading, you may want to change the "bezel" setting to 0 to turn it off. Otherwise, MAME will automatically display a virtual bezel around any game for which it has artwork, reducing the screen space that the game gets to use.

In the Core Vector Options section, you can change the way MAME emulates games that were originally meant to be played on a vector monitor. If you're having trouble seeing the bullets in *Asteroids*, for instance, increasing the "beam" value slightly may help.

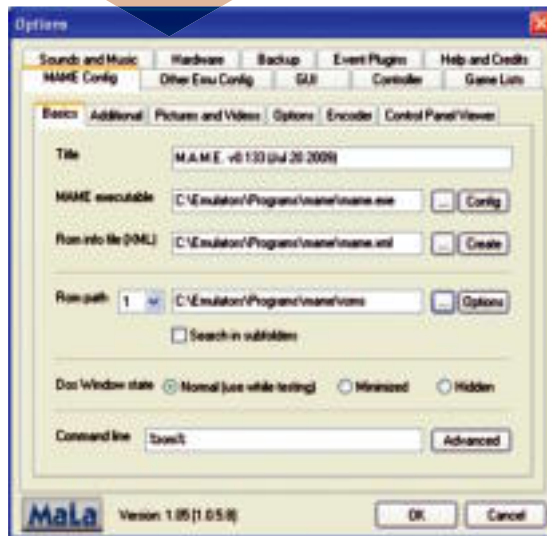
### 4 CONFIGURE MALA

Once MAME is properly installed, setting up MaLa is pretty easy. Just download the MaLa zip file and extract it to a folder in your emulation directory. Run `mala.exe`, and a dialogue box should pop up informing you that this is the first time MaLa has run, and that the configuration tool is going to open.

The configuration will open, with the MAME Config > Basics tab front and center. In the field marked MAME Executable, press the "..." button and select `mame.exe` from the MAME folder. MaLa should automatically find the `catver.ini` file and other information files. If it doesn't, you can locate them manually in the Additional tab. You can also define the fields in the Pictures and Video tab for the location of any additional art resources you've downloaded, which will allow MaLa layouts to use this information in your game lists.

In the Basics tab, tell MaLa where to find the folder with your ROMs in the field marked Rom Path. Using the drop-down menu, you can define additional locations for MaLa to search for ROMs, but for our

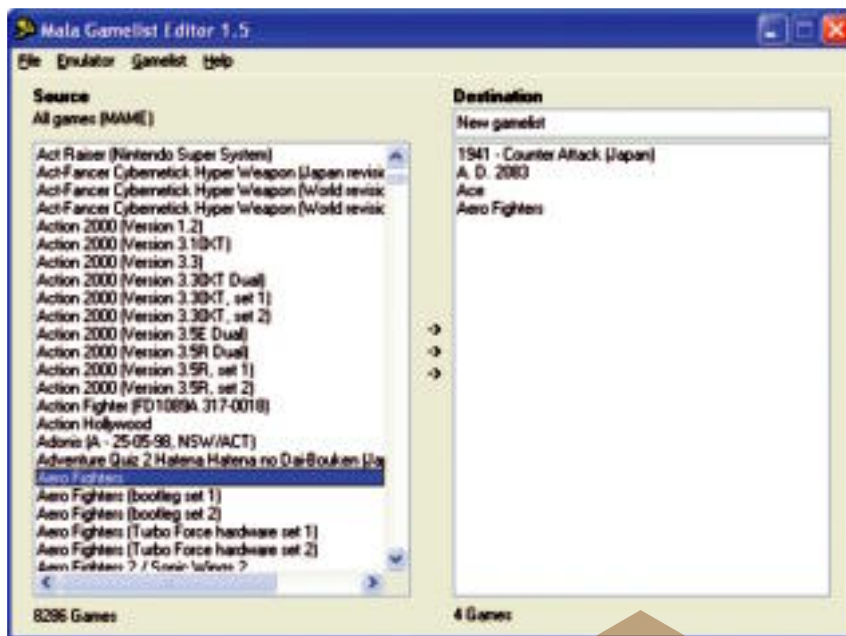
purposes that shouldn't be necessary. Hit OK. A box will pop up asking you to refresh your game list; click OK, and when it's done scanning your ROMs, MaLa will start.



lame. Fortunately, you can install a custom layout. First, you need to find a layout—a good source is the Layouts section of the MaLa website. When you download a layout, it will include an `.MLL` file and a set of art files, usually in a folder. Place the `.MLL` file as well as the folder of art files into the `MaLa/layouts` directory. It's important that the art files be in a folder in the layouts directory, with the exact same name as the `.MLL` file.

### 6 SET UP ROM LISTS

Finally, it's time to set up ROM lists, which sort your games into various lists within MaLa. For instance, you might set up a list of top-down shooters, or a list of games that can be played in "cocktail mode," with the screen flipping back and forth between two players. You can create and edit game lists within MaLa using the menu (by default, the 2



### 5 TWEAK MALA'S LAYOUT

But what's that? MaLa is ugly, you say? Well that's just because you're using the default layout, which is pretty

key), but if you want to quickly work with a lot of games, it's much quicker to use the `MalaGamelist.exe` program included with MaLa.

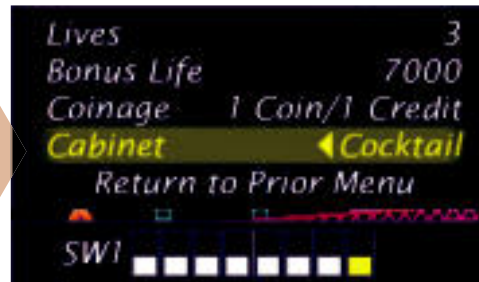
## 7 IN-GAME OPTIONS

Once you've got MAME and MaLa configured properly, it's time to actually launch a game. Assuming everything works properly, when you select a game from the list, MaLa will minimize and MAME will launch. In MAME, press the Tab key to access the options menu. From this menu, you can access two important options:

► **Inputs:** MAME can be configured to accept any keystrokes or any combination of keystrokes as an input for a button press or MAME action. Game inputs can

be defined generally (the "z" key always corresponds to button 1, for instance), or for a specific game, which overrides any general key bindings.

► **DIP Switches:** Older games used physical DIP switches on their PCBs to control the "settings" of the game. Common DIP settings might include the number of lives per coin, number of points to first bonus point, "free play" mode, and "cocktail" mode, where the screen flips back and forth between plays. MAME simulates



these switches, so you can change their configuration in the options menu to control your game's behavior. ☺

## BEYOND THE ARCADE

# Alternative Uses for MaLa

Now that you've seen MaLa in action, you're ready to explore its full potential. Here are three other ways you can put this handy front end to use.

### CONSOLE EMULATORS

MaLa may have been designed for MAME, but it can also be used to control any emulator that can be launched from the command line, such as ZNES ([www.znes.com](http://www.znes.com)) for Super Nintendo games and Fusion (<http://bit.ly/iX8S4>) for all of the Sega consoles.

To add a new emulator to MaLa, just install it somewhere in your emulation directory, alongside a folder for the emulator's ROMs. In MaLa, right-click and open the Options menu, then select the Other Emu Config → Basics tab. Click New, enter a name, and fill in the fields pointing to the emulator executable file and ROM folder.

### PINBALL EMULATORS

There are two kinds of arcade aficionados in this world: classic gamers and pinball enthusiasts ("pinheads"). Fortunately, MaLa doesn't take sides in this age-old conflict—the front end

can be used to launch emulators that will allow you to play faithfully simulated classic pinball machines, or all-new machines designed by fans.

If you want to play classic games in all their glory, you'll need both Visual Pinball, which renders virtual pinball playfields, and Visual PinMAME, which simulates the CPU and other electronics in pinball machines, including the LED scoreboard. Instructions for installing both can be found at <http://bit.ly/YWZLT>.

### JUKEBOX

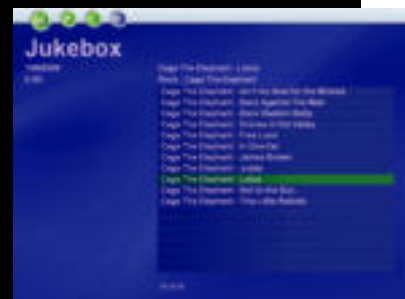
If you're almost sold on MaLa, but are holding out for a classic gaming front end that can play you some tunes, too, you're in luck.

MaLa has a simple, built-in jukebox that lets you play MP3s

while you browse through your games.

To enable Jukebox, right-click in MaLa, and open the options menu, then select the Sound and Music →

Jukebox tab. Make sure the Enable Audio box is checked, then click the Use Jukebox checkbox. Finally, tell MaLa where to find your music by clicking the Browse button, next to the Base Directory field.



## The Maximum PC Interview

# STAR TREK ONLINE

We chat with Craig Zinkievich, executive producer at Cryptic Studios, about making a game for Trekkers and competing with *World of Warcraft* BY NORMAN CHAN

Craig Zinkievich



Set 30 years after *Star Trek: Nemesis* (the last film before the J.J. Abrams reboot), *Star Trek Online* puts you in the shoes of a captain in a newly sparked war between the goody-two-shoes Federation and savage Klingon empire. The promise of exploring the final frontier, massive space battles, and obscure *Star Trek* references fills us with geeky glee. We went down to Cryptic Studios' offices to play the game and quiz Executive Producer Craig Zinkievich to ensure that fans of *Star Trek* and MMOs are getting the best of both worlds.

## STAR TREK ONLINE

**MAXIMUM PC** It looks like *Star Trek Online* is focusing more on action, as opposed to boring bits like interstellar diplomacy.

**CRAIG ZINKIEVICH** We've really tried to make the content in *Star Trek Online* feel as though you're in one of the *Star Trek* shows or movies. You're never just in one place. You can be on a ship, get a distress call, beam down to a planet, then beam up to a satellite that's on fire, and finally back to your ship for a climactic space battle. You're constantly moving between ground and space to really get that cinematic feel.

The biggest challenge in creating *STO* is that it's two whole games—you have your

ground combat and your space combat. But the game demands it; you have to go back and forth, and I think it'll be the strongest aspect of the game.

**MPC** How do these modes play out?

**CZ** Space combat is very much like the shows. It's not a dogfight—you're not zipping around. You're in huge 1,000-meter starships with hundreds of crew onboard. In the shows, it's all about tactics and positioning. It's about bolstering a shield that's taken damage, transferring power from your deflector dish to your weapons or engines at the right time. It's about knocking your enemy's shields down with phasers and taking them out with photon torpedoes.



The really cool powers come from your bridge officers. Like the shows, it's all about the people—who's there on the bridge during a crisis defines how the ship deals with it. You have a roster of bridge officers that you can upgrade over time. These guys are like MMO pets, but taken to the next level. You name them, customize their look, give them equipment, and level them up with new skills and specializations. And the skills they have really end up defining what role you play in missions.

**MPC** What about ground-based away missions?

**CZ** When you go down to a ground mission, you always play in a five-person

away team. If you're playing by yourself, you beam down with four bridge officers. If you're teaming up with other players, you're going to all go as captains.

**MPC** Sounds like that would be against protocol!

**CZ** Yeah, it's funny. You have protocols like the Prime Directive, but those things never come up in the shows unless they have to break them! So, yes, you're constantly breaking protocol by beaming down, but it wouldn't be fun just to sit on your ship.

**MPC** What type of loot will you be able to collect from missions and random exploration?

**CZ** With bridge officers, they all have a paper doll that needs to be equipped with armor, personal shields, weapons, and other tools, which you'll find on your missions. The same goes with your own character avatar. There are plenty of items and loot that you'll find within the game, which you can sell or trade at spaceports. You can even find potential bridge officers.

**MPC** Like an alien that you meet on a random world.

**CZ** Yes. Another one of the loot items that is very important on the ground missions is your kit, which is a career-limited loot item. The kit gives you really cool powers on the ground, like Security Escort, which



lets you beam in extra NPC characters for this mission.

**MPC A bunch of red shirts?**

**CZ** Exactly! They should have a much higher aggressiveness factor. These kits end up defining your role. Medical science players can deploy stasis fields with their medical tricorders. And over time, as you level them up, each kit can have up to four powers.

**MPC You mentioned spaceports. Do you mean space stations like Deep Space Nine?**

**CZ** There are several large social hubs within the game. Earth Space Dock is probably the largest one for the Federation. That's where you go to repair your ship, visit the auction house, and get access to new ships. There are major ones like Deep Space Nine, and minor ones like Memory Alpha, which have similar amenities.

**MPC Sounds like you're including a lot of details from the shows.**

**CZ** In almost all of the content that we've made, there are *Star Trek* references, like a familiar character's grandson or something that was alluded to once in an episode. We have pretty hardcore writers who end up getting all of those references in.

**MPC What kinds of compromises did you have to make for this to appeal to both MMO players and *Star Trek* fans who might never have played an MMO?**

**CZ** There are some compromises we've had to make, license-wise, like adding many phaser weapons variations [in addition to the two main types in *Star Trek* canon]. In terms of gameplay, our goal is to make a really deep MMO that doesn't scare away someone who has never played an MMO before. For example, the power-level interface has a complex mode where you can move individual power bars, but there's also a mode where you can use preset power levels for offensive or defensive stances.

**MPC Do you base the content on materials like the *Star Trek* technical manuals and the Klingon language?**

**CZ** We definitely use the technical manuals to get the scale right. We don't have plans to translate the game into Klingon, but who knows, maybe we'll figure out a way to get the community to localize it for us.



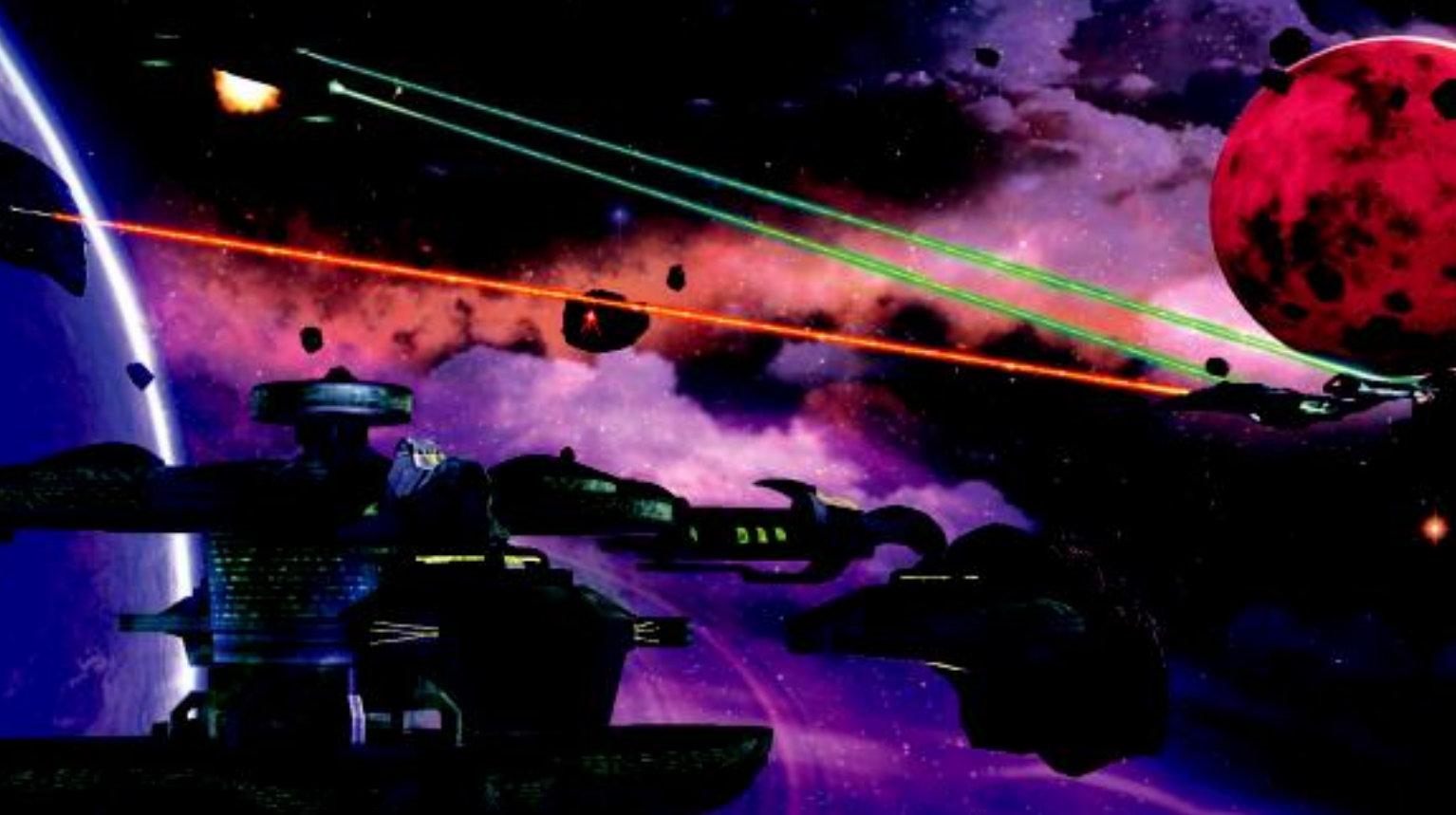
You take your bridge officers down on away missions, equipping each with tactical, engineer, or support skills. As a captain, you'll have access to two weapons and melee abilities, too.



Phasers have directional arcs that limit their range, so ship orientation is crucial to maximize firepower. You can also fly behind asteroids to seek cover or plot an ambush.



Space ports, like this Klingon shipyard, are social hubs where you can find teammates, purchase new ships, or sell loot. We hope to find one infested with Tribbles.



The Romulan Empire is in disarray after the destruction of its home world. You'll engage the Romulans amid a power vacuum in one of Star Trek Online's four main story arcs.

Each ship has four directional shields that have to be drained before the hull is vulnerable. You can divert power from weapons or engines to survive if you're losing a fight.

## THE 800-POUND MMO IN THE ROOM

**MPC** When you're designing a new MMO, how do you design it to compete with World of Warcraft?

**CZ** I don't know if there will ever be another World of Warcraft [-sized game]. The fact that WoW has so many subscribers is awesome, because it's exposed so many people to MMOs. Whether or not there will be another game that gets millions upon millions of subscribers isn't really [our concern]—we didn't sit down and ask ourselves how we could steal WoW subscribers.

We first asked ourselves how we could make a decent MMO, how we could develop a reasonable business model, and have reasonable expectations. And then, we tried to make it the MMO that the *Star Trek* universe deserves.

**MPC** And what business models work, if you don't want to compete with WoW?

**CZ** You can look at games like Warhammer and Conan, which launched with a few hundred thousand purchases. You can have a pretty nice business with a few hundred thousand users, or even fewer. So, I don't think many people going into the MMO market sanely think they need 10 million subscribers to make money.

**MPC** Is it a chicken-and-egg scenario where you need to have enough subscriber revenue to make new content to attract new subscribers?

**CZ** Definitely. There's a barrier. From our experience, if you don't break 100,000 subscribers at any point in time, your game tends to just go away. Most games that don't break that 100,000-subscriber mark tend to just be flashes in the pan. But once you do, you tend to get a really solid fan base with enough revenue to keep adding to the game, and things go pretty well.

**MPC** How do you determine the long-term plans for an MMO, given the uncertainty of success?

**CZ** We don't have life spans on our games, and we go into the first year with an expansion and update plan. That being said, though, from our experience, the longer you plan ahead, the more likely the plan is useless, because the subscribers will tell you what they like and dislike, and what they want to see more of. So, even though we put a plan out there, we have to be flexible and listen to our captive audience. Which is kind of the cool part about making MMOs. [Once it's released], it's not just us making the game—everyone contributes. ☺

LEARN MORE AT  
**MAXIMUMPC.com**  
<http://bit.ly/3ekvDt>

# WHITE PAPER

## The TRIM Command

Preventing SSD write slowdowns is possible, simply by scheduling deletions **-NATHAN EDWARDS**

**T**hough solid state drives have existed for years, it is only recently that they've gained any sort of market penetration for average users. As we stated in our February 2009 white paper on the subject, solid state drives offer many advantages over traditional magnetic drives. Unlike mechanical hard drives, SSDs have no moving parts, so they draw less power and produce no vibrations. They're also more resistant to physical shock. And most importantly, solid state drives offer much higher read and write speeds than traditional hard drives—at least when they're new. Due to their NAND flash architecture, SSDs can suffer serious slowdowns once they run out of fresh blocks to write to. The TRIM command, found in Windows 7 and newer releases of the Linux kernel, aims to fix this. But what is TRIM, and why is it even necessary?

### WHY IS TRIM NECESSARY?

When a file is deleted, the operating system doesn't erase the data right away—instead, it marks that area on the disk as overwriteable in the index of all files on the disk, so the next time data needs to be written to the drive, it can use the space previously taken up by that file. This, incidentally, is why file recovery software works—provided the space hasn't been written over, the data is still on your drive and can thus be recovered. It's important to note that the drive itself doesn't know anything about the status of the data on the drive. This blind-drive system works fine for mechanical hard drives since they can overwrite old data with no penalty, but because of the way NAND flash memory is arranged, slowdowns can occur once all the

blocks on the drive have been used once.

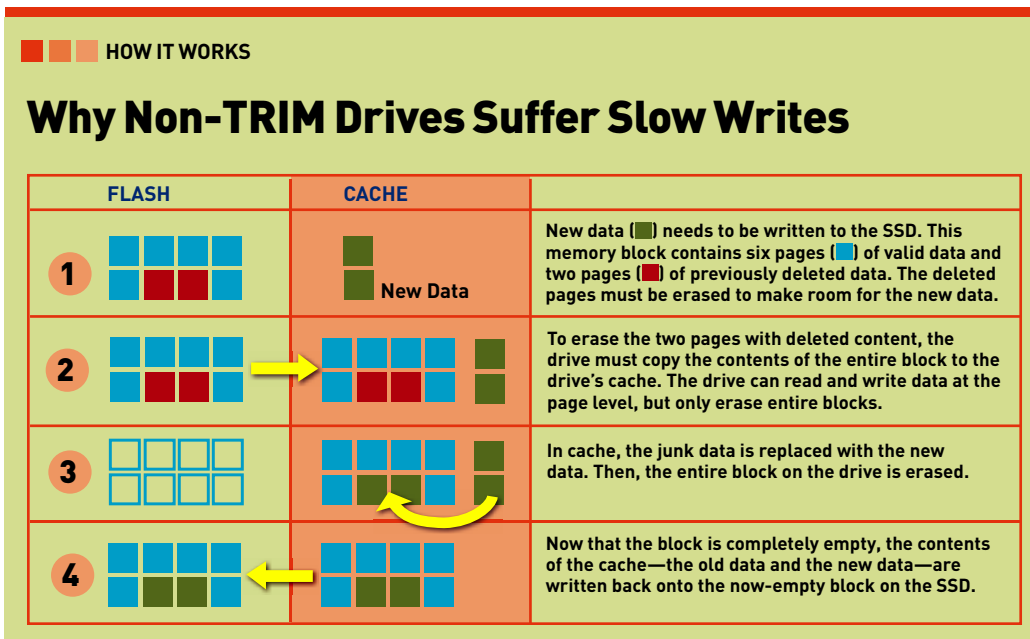
The flash memory in solid state drives typically stores data in 4KB chunks, called pages, grouped in blocks of 128 pages each. Data can be read and written at the 4KB page level, but can only be erased at the 512KB block level. And while reading data and writing to unused pages on an SSD is much faster than on a standard hard drive, overwriting data is a complicated, multi-step procedure, one that SSDs typically perform only when they have run out of fresh blocks to write to.

When an SSD runs out of fresh blocks, it has to write over data the file system has marked as deleted. And that's where the slowdowns begin. To overwrite a single 4KB page the file system first has to copy the entire 512KB block to its memory cache. Then, in cache, the overwriteable pages are deleted and replaced with the new data. Next, the entire 512KB block on the drive is erased and rewritten with the cached data. If you're writing to many blocks at a

time—either through a series of small random write operations, or simply by writing a large file to disk—you can overload your drive's cache pretty quickly, and then your write speeds will plummet. You can imagine how slow it can be when you're writing a 2GB file or performing lots of 4KB writes. Users of early SSDs sometimes found themselves with write latencies of up to a second. To compensate, SSD manufacturers began increasing the size of their drives' DRAM cache to 64MB or even 128MB, and adopting faster drive controllers. This largely eliminated random-write stuttering, but drives were still slowing down as they ran out of fresh pages.

### WHAT TRIM DOES

In a nutshell, the problem is that the OS and the file system don't communicate information about deleted files to the SSD, and all writes to pages that contain unerased deleted data require a full block-level erase and rewrite, which can drastically reduce write



# SteelSeries Ikari Laser Gaming Mouse

It's been a few years since we took apart a mouse so you could see what makes it tick. This time we're looking at the SteelSeries Ikari Laser. Why? This gaming mouse features a laser sensor and support for multiple profiles.

speeds. There are two approaches to fixing this problem. The first is to run a garbage-collection program periodically that scans the entire drive and erases the contents of deleted pages. Many drive vendors now ship a program called wiper.exe that will erase deleted pages throughout the entire drive to return it to like-new performance. In some cases this program actually completely clears the drive, requiring valid data to be backed up beforehand. The second, better approach is to have the OS tell the drive when data is deleted, so that the drive can erase those blocks immediately. That's what the TRIM command does.

When a file is deleted on a TRIM-enabled system, the OS sends a command to the SSD to let it know that the data in a particular set of pages can be overwritten, moving control over deleted data from the OS level to the drive's firmware. The SSD then copies the blocks containing the deleted data to cache, erases the blocks, then rewrites only the pages with data on them. Thus, the caching and erasing process is moved out of the time-sensitive write cycle and into the time between the actual deletion and the next write, so the slowdown is less likely to cause a noticeable performance hit.

## ADOPTION

For the TRIM command to work, both the OS and the drive need to support it. TRIM is implemented in the Linux kernel as of revision 2.6.28, as well as in Windows 7, and all major SSD manufacturers have announced support. TRIM support may be added to some older drives via a firmware update, but not all older drives can support the TRIM command. If you plan on buying an SSD, make sure it supports the TRIM command—and if you already own an SSD, contact the vendor to see if a firmware upgrade is available. If not, your best bet is to see if your manufacturer has an SSD optimization utility (frequently called wiper.exe) that you can run on a regular basis to erase deleted pages. ☺



**SCROLL WHEEL** One side of the wheel's axle is hexagonal and fits into a mechanical click-counter, which counts how far you scroll.

**PRESSURE SENSORS** These three Omron pressure sensors register right, left, and scroll-wheel clicks.

**LCD SCREEN** The Ikari lets you program two sensitivity settings, which you can switch between on the fly. They are stored on the mouse, not on your system, and the LCD screen tells you which of your custom profiles is enabled, as well as displays the DPI when you're setting up a profile. Necessary? Not really. Awesome? Yes.

**USB MICROCONTROLLER** This Cypress Semiconductor USB microcontroller is the mouse's main control unit, while an attached 8KB EEPROM stores macros and sensitivity profiles. It also drives the LCD screen using a Sitronix dot-matrix LCD controller.

**LASER DIODE AND OPTICAL SENSOR** The Ikari's Cypress Semiconductor laser navigation system shines a laser onto the tracking surface, from which its sensor reads 40,000 samples per second to determine speed and position. The sensitivity is adjustable from 1 to 3,200 DPI.



**SUBMIT YOUR IDEA** Ever wonder what the inside of a power supply looks like? Don't take a chance on destroying your own rig; instead, let us do the dirty work. Tell us what we should crack open for a future autopsy by writing to [comments@maximumpc.com](mailto:comments@maximumpc.com).

# HOW TO

## Step-by-Step Guides to Improving Your PC

### THIS MONTH

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### WINDOW'S HIDDEN TWEAKERS

User-friendliness isn't exactly Windows' strong suit.

In fact, there are dozens of tweaking utilities that exist solely to give you direct access to the myriad hidden configuration settings in Windows.

But you don't have to rely on third-party applica-

tions to make Windows do your bidding. If you're brave enough to dig deep into the Control Panel, you'll find tools like Computer Management that give you access to Windows Services control and storage management.

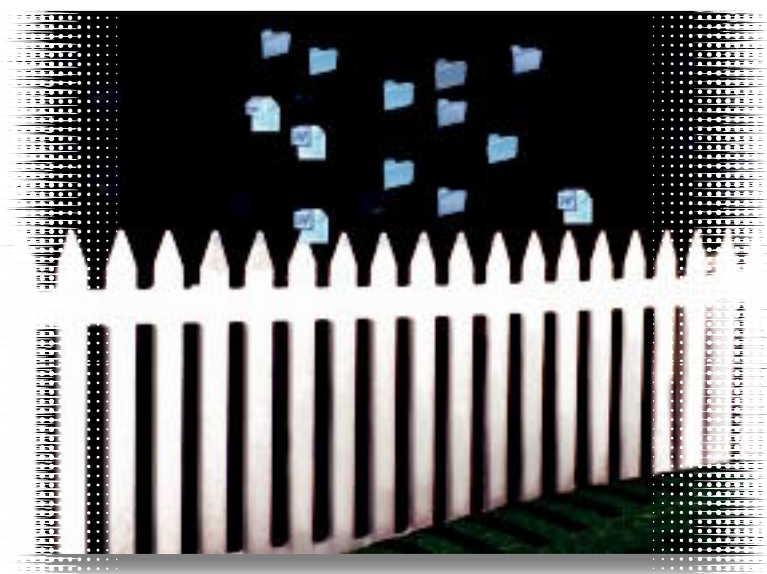
Another little-known system tool is the Local Group Policy Editor, which lets you control minute interface options for every user on your PC. This is useful if you want to restrict access to potentially system-breaking settings on your children's computers, or put up a public computer kiosk. We've written up a handy guide to mastering this utility here: <http://bit.ly/wg39h>.

While third-party tweaking utilities are a convenient way to customize your computing experience, they often add an unnecessary interface layer. As power users, you should become familiar with these hidden configuration menus, even if Windows doesn't make it easy for you to access them.



**NORMAN CHAN**  
ONLINE EDITOR

### WINDOWS TIP OF THE MONTH



## Corral Your Desktop Icons

Keep your Desktop folders and application shortcuts organized by grouping them with Stardock Fences (<http://bit.ly/1ZuhG8>). Finally out of beta, this freeware app lets you create invisible enclosures on the Desktop to keep your icons in check. You can label these groups and drag them around, or even hide all your icons by double-clicking the Desktop.



### SUBMIT YOUR IDEA

Have a great idea for a How To project? Tell us about it by writing to [comments@maximumpc.com](mailto:comments@maximumpc.com).

## Build a Stereoscopic 3D Camera Rig



**T**he 21st century has seen a resurgence in the popularity of stereography, or 3D imagery, and thanks to the availability of inexpensive digital cameras and photo-processing software, do-it-yourself 3D imagery is now possible.

The simplest method for taking a 3D photo requires just a single camera, and a stationary subject. Place your feet firmly on the ground, with your weight on your left foot, and take a picture. Shift your weight to your right foot and take a second picture. You now have a stereo pair of images, one for the left eye and one for the right eye, which can be viewed in 3D. Obviously, this technique, called “sidestep” or “cha-cha” 3D, only works for subjects that are not in motion.

To take stereographs of dynamic subjects, we will need to take two photos at exactly the same time. Japanese camera manufacturer Fuji recently released the first digital camera equipped with two lenses for 3D. Of course, for the technologically savvy, you can make your own 3D camera rig using common building materials and two digital cameras.

For this project, we’ll use a pair of matching Canon PowerShot cameras



and specialized synchronization software called StereoData Maker, or SDM, which is a nonvolatile firmware upgrade based on CHDK, the Canon Hack Development Kit. SDM adds

a set of features to certain Canon cameras, specifically for the taking of 3D pictures. —ERIC KURLAND

## What you need:

- Two Canon PowerShot cameras compatible with SDM (<http://bit.ly/16n75l>)
- Two 4GB SD cards
- Two right-angle metal brace clips
- Two tripod screws or 1/4-inch thumbscrews
- Cloth tape or sturdy electrical tape
- Metal washers
- Two USB cables
- Altoids tin
- Push-button switch (<http://bit.ly/fvZPp>)
- Two female USB connectors
- Battery holder
- Three 1.5V AAA batteries
- Hot-glue gun
- A Dremel tool
- Red/cyan 3D glasses (<http://bit.ly/2q9eds>)



## 1 LOAD SDM FIRMWARE

First, you will need two Canon PowerShot cameras (they don't need to be the same model) and the corresponding StereoData Maker firmware. While SDM isn't available for all Canon PowerShot models, it does work on a wide variety. A full compatibility list can be found at the Stereomaker.net website (<http://bit.ly/16n75l>). Scan the list for your cameras and download the specific firmware and common\_files.zip for each. Unzip both archives to the same directory.

SDM comes with a simple installer program that will format your SD cards and install the SDM files. Run the sdminste.exe executable, insert one of your SD cards into a card reader on your PC and click "new install." Select whether this flash card will be for the left or right camera and click OK, then follow the onscreen instructions for formatting. Do

the same for the other card. Make sure to note which card is for the left camera and which is for the right. Slide the physical write-protect tab down on the SD cards and insert each into the proper camera. The firmware only loads from the cards when they are in the "locked" position, but the cameras are still able to write photos to them normally.

## 2 BUILD THE MOUNTING RIG

The next step is to mount the cameras in a side-by-side orientation. Some hobbyists sell specialized 3D slidebars for two cameras online, but you can make your own. This can be as simple as drilling two holes in a wood ruler and bolting the cameras down with 1/4-inch thumbscrews. Ideally, you want the lenses of your cameras as close together as possible—about the distance between two human eyes. The best way to do this is with one of the cameras turned upside down. To mount the cameras in this way, we will build something called



a z-bar with two right-angle truss clips or braces, which you can buy at any hardware store.

Align the sides of these two bars and fasten them together using heavy cloth tape, leaving the holes along the base exposed. With 1/4-inch thumbscrews, mount a camera onto each clip, using metal washers on each side of the base to make sure you get a tight, level fit. Position the cameras so that the centers of the lenses are as evenly aligned as you can make them. Don't worry if the alignment isn't 100 percent perfect, as we can correct the images later in software.

## 3 BUILD A USB SWITCH REMOTE

One of the functions added by StereoData Maker is synchronization of the cameras' shutters via a 5-volt pulse sent through their USB ports. This requires that a battery-powered switch be attached to both cameras via USB cables. The Stereomaker.net website contains several varying schematics for this synch controller circuit. The simplest to assemble uses a pair of USB connectors with both pins 1 wired to a button, and both pins 4 wired to a negative battery terminal. The batteries' positive terminal connects to the other contact on the button, so that when it is pressed, it completes the circuit to both cameras. The cameras need to receive a 4.5- to 5-volt pulse, so you can use a combination of three 1.5V AAA batteries.

You can build this circuit into any small enclosure, such as an Altoids tin, which has a hinged lid for easy access. We found female USB connectors, battery holders, soldering supplies, and push-buttons online at Allelectronics.com.



Cut openings into the side of the Altoids tin to fit the two USB ports and glue the ports in place. Drill a hole in the face of the enclosure for the push-button as well. On the battery holder, connect the positive battery wire to one contact on the button switch, and carefully solder the negative battery wire to pin 4 on both USB ports. Solder a short wire from pin 1 on both USB ports to the other contact on the button. You can use the USB cables that are supplied with the cameras to connect them to your synch controller.

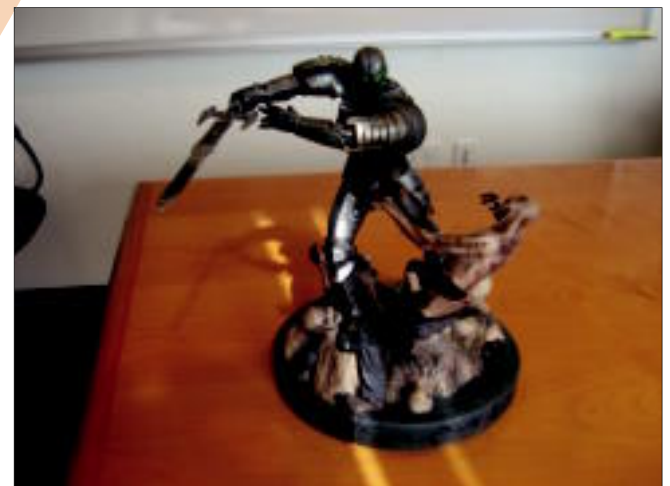
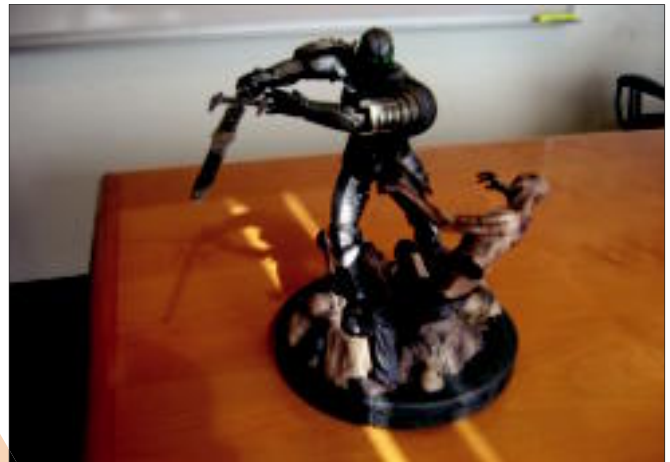


Alternatively, you can hardwire USB cables to the controller in place of the connectors. If this step seems too daunting, there are links on the StereoData Maker website to sources that sell pre-assembled USB switches.

#### **4 SHOOT YOUR PHOTOS**

Once you have the hardware assembled and the StereoData Maker firmware installed onto the SD cards, you are ready to start shooting 3D pictures. Power up both cameras and wait for the SDM splash screen to appear. You can access the SDM menus by briefly pressing the “direct print” button to put the camera into <alt> mode, followed by the menu button. The SDM menus contain numerous options for both beginners and more advanced stereo photographers. For now, we will just check to ensure that the USB synchronization is turned on. Make sure that any settings you adjust on the left camera are also changed on the right camera. Press the “direct print” button again to exit the SDM menu.

You can now set your cameras up as you normally would to take a photo, adjusting the ISO, shutter speed, and aperture identically on both cameras. Press and hold the button on your USB switch to auto-focus. When both cameras are ready, their blue LEDs will light up. Release the USB button and both cameras fire simultaneously, capturing your stereo pair. A general rule of thumb for taking good 3D photos is that the distance between the rig and your subject should be at least 30 times the distance between your two lenses. In other words, if your lenses, measured from center to center, are 2.5 inches apart, you should be at least 75 inches, or about 6 feet, away from your subject.

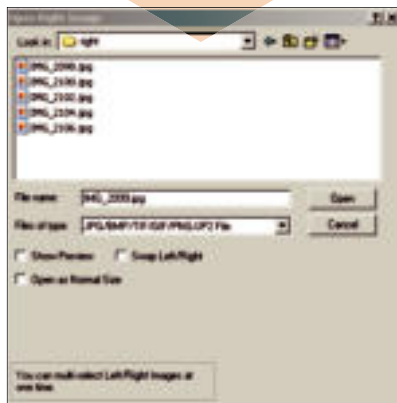




## 5 PROCESS YOUR PHOTOS

Now that you have taken a pair of images, it's time to look at them in 3D. To do this, the two images need to be aligned and put into a format suitable for 3D viewing. While this can be done with general image-processing programs such as Adobe Photoshop, most stereographers prefer a specialized freeware application called StereoPhoto Maker (<http://bit.ly/4nZzYM>).

Begin by downloading and installing the StereoPhoto Maker program. Remove the SD cards from your cameras and copy the contents onto your PC. We recommend



organizing your files into subdirectories for left and right images to make it easier to keep track of them. Run the StereoPhoto Maker program and under the File menu, select "open left/right images." A dialog box will open, asking for the left image. Browse to the folder with the left photos, select a file, and click Open. Do the same for the right-side image, selecting the corresponding picture from the folder with the right-side images. The program will open both files and show you the two pictures side-by-side.

Under the Adjust menu, select "auto color adjustment" to match the tone of the two images. Next, select "auto alignment," and StereoPhoto Maker runs an algorithm that corrects for misalignments between the cameras, and sets the stereo window based on the nearest point in the shot. Once the auto-alignment is finished processing, you can put on your red/



cyan 3D glasses, select a color anaglyph mode from the Stereo menu (we prefer Dubois anaglyph, for its color correction), and marvel at the depth in your 3D photo. If you would like to make more advanced alignments, you can select the easy adjustment mode, and do manual corrections as needed. StereoPhoto Maker will allow you to save your pictures as anaglyphs, parallel, or cross-view pairs, and will even print out a vintage-style stereo card for your Victorian stereoscope.

### ADDITIONAL RESOURCES

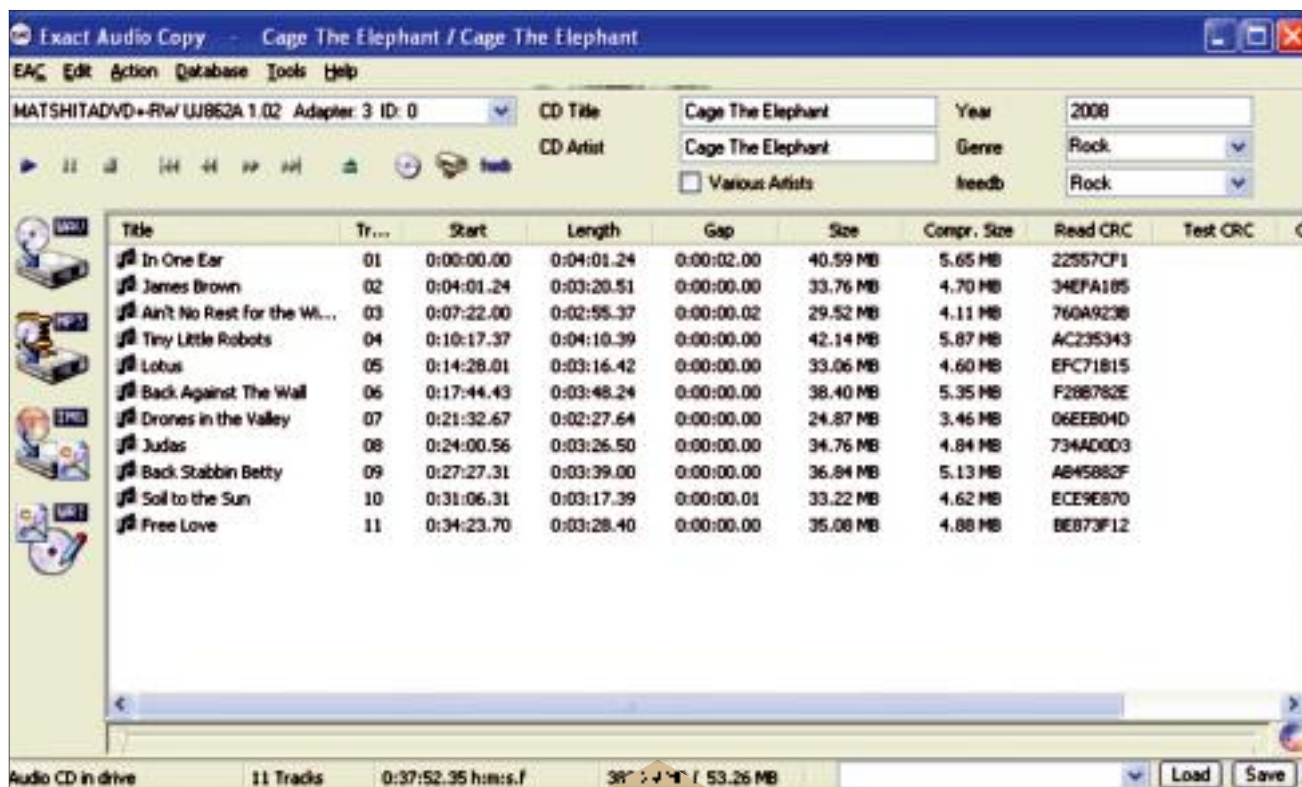
#### ► Stereo Club of Southern California

The Los Angeles-based 3D club offers 3D tutorials and information on 3D photography on its website ([www.LA3-DClub.org](http://www.LA3-DClub.org)).

► **3-DIY.com** The author's website on do-it-yourself 3D.



# Rip Archival-Quality MP3s from Audio CDs



There was a time when ripping a CD was a time-intensive, error-prone process. But these days, with programs like iTunes turning the task into a one-click affair, CD ripping has become fast, easy, and reliable enough that backing up your music library is more simple than programming a VCR. However, using a program called Exact Audio Copy, you can achieve even better-quality rips than you can with generic music library managers.

EAC is an “audio grabber,” or ripping program, that’s beloved by the digital music world. It has earned this adoration by providing the tools needed to make the most accurate rips possible, with the fewest errors, and giving you complete control over how your MP3s are tagged and organized. And although getting EAC set up is a little more complicated than, say, iTunes, we’ll walk you through the process, and show you that it’s not that hard to make top-quality audio rips.

—ALEX CASTLE

## 1 INSTALL LAME

Before we install EAC, we have to install LAME. LAME, short for Lame Ain’t an MP3 Encoder, is in fact an MP3 encoder. It allows EAC to take the raw .wav files ripped from the CD and compress them into more useful high-bitrate MP3s.

The LAME homepage (<http://lame.sourceforge.net>) provides information about the encoder and offers its source code, but you can download pre-compiled executables of the LAME code at RareWares ([www.rarewares.org](http://www.rarewares.org)). If you download the zipped binaries from RareWares, there’s no installation to speak of—you just unzip the files, including LAME.exe, into a folder and you’re good to go. We recommend putting them in a subdirectory of Program Files.

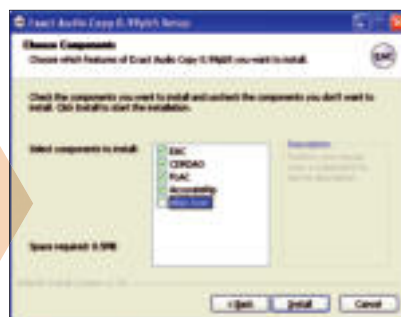
## 2 INSTALL AND CONFIGURE EAC

Next, you’ll need to visit the EAC website ([www.exactaudiocopy.de](http://www.exactaudiocopy.de)) and download the latest version of the software. Run the executable, and install it

wherever you like. Pay attention during the installation, as EAC will try and slip an eBay button onto your system, unless you uncheck the box when it asks which features you want installed.

Once the installer is finished with its work, EAC will launch and the configuration wizard will start. Here, it will attempt to locate the drive you’ll be using to rip CDs; confirm that it has found the correct drive, or select the one you wish to use. When the wizard asks if you want to focus on speed or ripping accuracy, select ripping accuracy.

Now, EAC will run diagnostics on your CD drive. You’ll be asked to insert a clean music CD, so pick an unscratched disc from



your collection, pop it in, and press Next. Assuming there were no problems with your CD drive, you'll be able to click through a few more install screens, until it asks you what sort of compression you want to use. Select the MP3 option. It will then inform you that you need an MP3 encoder, which you've already downloaded, so browse to the folder holding the LAME.exe file when EAC starts searching for it.

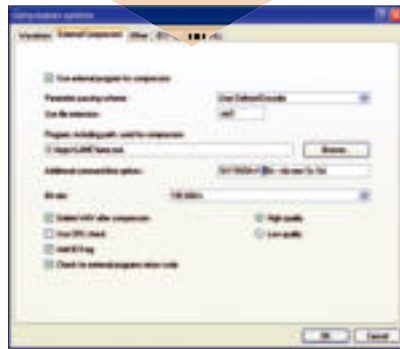
Now, you'll be asked to enter an email address, which is required for you to access the freeDB online ID3 tags database. Finish off the configuration wizard by selecting a file naming scheme for your rips from the huge selection in the dropdown. When prompted, choose to run EAC in expert mode.

Now that the configuration wizard is done, there are still a few more options to change to get the most out of EAC. First, go to EAC > Drive Options, and dismiss the warning box that pops up. Now, insert a scratched CD into your drive, and click the Examine C2 Feature button. If EAC tells you that your drive is capable of finding C2 error information, check the box next to "Drive is capable of retrieving C2 error information." This will noticeably increase the speed of your rips.



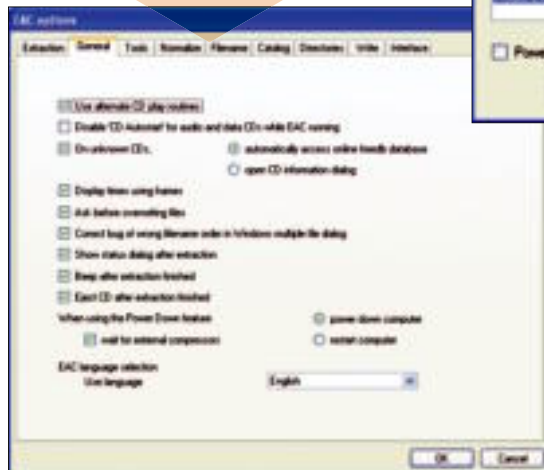
Next, we'll configure the MP3 bitrate, so click to EAC > Compression Options. LAME can encode MP3s in all sorts of different bitrates, but we're not living in 2003 here—storage is dirt-cheap and everyone's an audiophile, so we're going to set EAC to use LAME's V0 profile, the highest variable bitrate setting. To do

this, change the field labeled "Additional command-line options" to %l-V 5%l%h-V 0%h --vbr-new %s %d. (Note that the number in the middle has changed from a 2 to a 0.) With these command-line options, as long as the "High quality" radial button is selected, LAME will use the V0 profile, regardless of what is selected in the bitrate dropdown menu.



To automate your rips, change these options: In the General tab, check the box marked "On unknown CDs" and click the radial button next to "Automatically access online freedb database." Also, check "Eject CD after extraction finished" for faster ripping of multiple discs.

In the Directories tab, click the "Use this directory" radial button, and select a folder to store your newly encoded MP3s.



### 3 RIP A DISC

Finally, it's time to rip a disc to your hard drive. Insert a music CD into your drive and EAC will display a list of tracks. If you selected the "Automatically access online freedb database" option, as instructed, EAC should automatically download track names and other ID3 tags for the CD. Give the tags a quick once-over, to make sure they're correct.

Click Action > Test & Copy Selected Tracks > Compressed to kick off the burning process. From here on out, it's hands-off—just give EAC time to do its thing. It will take considerably longer to rip the MP3s with EAC than it would with iTunes, but the MP3s created will be as close to error-free as you can get. ☺



# REVIEWS

## Tested. Reviewed. Verdictized

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# AVADirect Custom PC

## A multiplier too far? This gaming rig is fast, but not quite stable

**W**hat sets a boutique builder apart from a huge OEM? Taking risks with hardware, that's what.

Unfortunately, taking risks doesn't always pan out. Take AVADirect's Custom PC. Hot on the heels of numerous Core i7 rigs tipping the 4GHz and 4.2GHz range, AVADirect went a step further by clocking its Custom PC gaming rig at 4.4GHz. The company even goes so far as to include a custom profile for 4.7GHz—a speed the company had originally promised it would hit out of box, until cooler heads prevailed.

The bad news is that even at 4.4GHz, we were able to break the AVADirect machine with our stress test. The good news is that the machine remained stable in our benchmarking runs. Still, if we could stress it enough to reboot in two hours, someone else could, too. Working with AVADirect, we were able to get the machine to rock-solid levels at 4.4GHz, but it took several days of testing and more than 25 different BIOS combinations—which somewhat tarnishes the feat.

Instability isn't the only issue we have with the Custom. We're not sure we'd make the same hardware choices the company did. We certainly can't quibble with the use of Intel's Core i7-975 Extreme Edition, nor the 6GB of Corsair DDR3/1333, 1KW PSU, and EVGA X58 SLI Clas-

sified x58 board. Heck, we even like the 1TB of RAID 1 storage for bulk storage. What we're not totally sold on is the use of four OCZ 30GB Vertex MLC SSDs in RAID 0. It's not the Vertex drives, per se, it's the use of the onboard RAID controller. With magnetic storage, we haven't seen on-board RAID scale with four drives very well, and the SSDs probably make it worse. In informal tests with HD Tach, we saw an average read speed of only 120MB/s on the RAID. Velocity Micro tried the same trick with its Raptor SE last month, but its use of the ultra-pricey Intel SLC drives helped put average reads in a somewhat defensible 250MB/s range.

Of course, even more controversial is the GPU choice. With ATI's Radeon HD 5870 crowned as the new king of the hill, we were surprised AVADirect went with two hotter and hungrier EVGA GeForce GTX 295 cards. But once we saw the third x16 slot stuffed with a GeForce 250 GTS card, we figured AVADirect is buying into the PhysX hype.

In performance, the Custom PC is fast, but not where you'd expect a 4.4GHz box to fall. Compared to previous Vista-based boxes, it's almost on par with the 4GHz Maingear Core i7 that we reviewed in August. The quad-SLI



AVADirect's Custom PC includes a third graphics card for PhysX fans.

solution also showed scaling weakness in our UT3 benchmark against the tri-SLI rigs. Tri-SLI machines pushed the 200fps mark in UT3, while the quad was mired at 155fps. Of course, you can shrug this off as meaningless since 150fps is pretty excessive in a mostly DX9 game. In Crysis, the Custom is second only to the Velocity Micro. That same Velocity Micro, however, is faster in every benchmark than the AVADirect, and ships with Windows 7, to boot. AVADirect will, of course, provide a free Windows 7 upgrade, but why ship with Vista now?

The final verdict on the AVADirect Custom PC is that it's actually a pretty nice machine if you buy into the PhysX game, but instability on a \$7,000 rig is still unforgivable.

—GORDON MAH UNG

SPECIFICATIONS	
Processor	Intel 3.33GHz Core i7-975 Extreme Edition@4.4GHz
Mobo	EVGA X58 SLI Classified
RAM	6GB Corsair DDR3/1333
Videocards	Two EVGA GeForce GTX 295 in SLI, one GeForce 250 GTS
Soundcard	N/A
Storage	Four 32GB OCZ Vertex MLC SSDs in RAID 0, two Samsung 1TB Spinpoint F1 in RAID 1
Optical	LG GGGW-H20L
Case/PSU	Custom Cooler Master Cosmos S, 1,000W modular PSU

VISTA 64-BIT BENCHMARKS		ZERO POINT	
Premiere Pro CS3	1,260 sec	468	(+169%)
Photoshop CS3	150 sec	78	
Proshow	1,415 sec	467	(+203%)
MainConcept	1,872 sec	888	(+111%)
Crysis	26 fps	68	(+160%)
Unreal Tournament 3	83 fps	155	

Our current desktop test bed consists of a quad-core 2.66GHz Intel Core 2 Quad Q6700, 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard. We are running two EVGA GeForce 8800 GTX cards in SLI mode, a Western Digital 150GB Raptor, a 500GB Caviar hard drive, an LG GGC-H20L, a Sound Blaster X-Fi, and a PC Power and Cooling Silencer 750 Quad. OS is Windows Vista Home Premium 64-bit.

**VERDICT** 6

**AVADIRECT CUSTOM PC**

<p><b>DIET COKE</b></p> <p>Perhaps the ultimate machine for PhysX gaming.</p>	<p><b>DIET PEPSI</b></p> <p>Initially unstable under heavy loads; very loud.</p>
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**\$7,115, [www.avadirect.com](http://www.avadirect.com)**

# Asus P7P55D Deluxe

## Need overclocking?

In motherboards—as in life—it’s the little things that bring the greatest pleasure.

Take the new Core i5/i7 LGA1156 board, the Asus P7P55D Deluxe. Enthusiasts are used to the flashy heatsinks and tons of ports and slots, but small touches like Asus’s innovative RAM slots will make you take notice. Instead of using the typical latch connectors that can snag the GPU, Asus has designed a system that requires only one side of the RAM to be latched in.

But adding unexpected conveniences is Asus’s M.O. of late. The board also features snag-free I/O shields, a quick-connect for front-panel connectors, and ExpressGate—the somewhat handy pre-OS boot environment. Besides adding such extras, Asus said it spent an inordinate amount of time making

OC Tuner successfully took the board from 2.93GHz to an extremely stable 3.87GHz.

We didn’t get quite as far with Gigabyte’s GA-P55-UD6 automatic overclock feature, but manual overlocks will likely find both boards in the same neighborhood. With this class of motherboard, the limit on overclocking is usually in the CPU, the RAM, the cooling, or the PSU—not the board.

While the overclocking story on the P7P55D was great, the performance was a mixed bag. Generally, motherboard performance in the days of highly integrated core-logic chipsets tends to be boring, with little variance among boards, but we experienced some odd results with the P7P55D that had us scratching our heads. It’s our theory that unexpected discrepancies in performance are the result of Turbo

Boost. Intel’s Nehalems automatically overclock based on thermals, power load, and the threading workload. Those are enough variables to make head-on performance evaluations tough. We could disable Turbo Boost, but since that’s not a mode anyone would actually run in, the results would be of little value.

Our final conclusion is that the P7P55D Deluxe is slightly slower than the Gigabyte GA-P55-UD6, but not enough to matter. After all, these boards use the same Intel P55 chipsets. What it comes down to is features. The GA-P55-UD6 has the more flexible six-DIMM configuration and boots faster (15 seconds vs. 30 for the Asus), but doesn’t auto-overclock as well. The Asus P7P55D obviously has overclocking tools galore, including the unique

overclocking remote, and saves you about \$30.

This is essentially a Taiwanese standoff, with neither board likely to back down. You could almost make your pick based on color and be happy either way. —GORDON MAH UNG

### BENCHMARKS

	P7P55D Deluxe	GA-P55-UD6	Percentage Difference
<b>PCMark Vantage 64-bit Overall</b>	6,693	<b>7,536</b>	12.6%
<b>Everest Ultimate MEM Read (MB/s)</b>	<b>15,750</b>	12,997	-17.5%
<b>Everest Ultimate MEM Write (MB/s)</b>	<b>13,543</b>	10,811	-20.2%
<b>Everest Ultimate MEM Copy (MB/s)</b>	15,432	15,414	-0.1%
<b>Everest Ultimate MEM Latency (ns)</b>	50.1	<b>53</b>	5.8%
<b>Sisoft Sandra RAM Bandwidth (GB/s)</b>	16.7	16.7	0.0%
<b>3DMark Vantage Overall</b>	15,036	15,002	-0.2%
<b>3DMark Vantage GPU</b>	12,254	12,231	-0.2%
<b>3DMark Vantage CPU</b>	47,120	46,815	-0.6%
<b>Valve Particle Test (fps)</b>	154	<b>159</b>	3.2%
<b>Crysis CPU (fps)</b>	145	<b>156</b>	7.6%
<b>Resident Evil 5 (fps)</b>	<b>120.5</b>	115	-4.6%
<b>World in Conflict (fps)</b>	239	<b>282</b>	18.0%

Best scores are bold. We tested both motherboards using a Core i7-870, 4GB of DDR3/1333 Corsair DRAM, an EVGA GeForce GTX 280, a Western Digital Raptor 150GB, and 64-bit Windows Vista Home Premium.

sure the board overclocks like a champ. There are multiple ways to overclock: using the Turbo V function, AI Suite, and the OC Tuner in the BIOS. If that’s not enough, the company even includes three ominous switches to let you override BIOS limits on RAM, memory controller, and CPU voltage. Even more interesting is the Turbo V remote. This wired remote lets you power up or down and select from three overclocking profiles or crank up the Bclock in real time.

Since Asus emphasized the automatic overclocking features of the board, this is what we were most interested in testing. The Turbo V auto-overclock was not only fun to watch in action but also fruitful, giving us a 20 percent clock bump. But we actually had the most success overclocking our Core i7-870 using the OC Tuner feature in the BIOS.

**VERDICT**

**9**

**ASUS P7P55D DELUXE**

**+** CONNOR MACLEOD

Three overclocking choices to pick from; single-latch RAM.

**-** DUNCAN MACLEOD

Do you really need to overclock your machine in real-time from three feet away?

\$220, [www.asus.com](http://www.asus.com)





Asus's P55 board features single-latch DIMMs for easy RAM removal.

# HP w2338h

## Color us thoroughly unimpressed

Three-quarters of the way through our product-testing regimen, we saw HP's unremarkable 23-inch display headed toward a verdict of 6 or 7. It has a couple of nice features—as well as a couple of odd omissions—but at that point we hadn't encountered anything that would set it apart from the crowd either way. But then we came to the Extreme Grayscale phase of the DisplayMate benchmark and our eyes just about popped out of their sockets.

This test renders extremes in the grayscale, beginning with boxes of increasingly intense shades of gray displayed on black and then white backgrounds. The w2338h had no problems passing the first half of this test, and it performed as expected when we cycled through shades of blue, red, and magenta. But the monitor proved incapable of differentiating between any of the high-intensity shades of green displayed on a fully saturated green background. What should have been cyan boxes on a cyan background showed up as yellow, and what should have been yellow boxes on a yellow background were rendered green, instead.

We suppose we could attribute the w2338h's poor performance to the fact that it's based on an LCD panel that's capable of delivering only six-bit color depth, and that it uses frame-rate control to simulate the production of 16-plus million colors; but we've seen a number of six-bit/FRC panels that didn't exhibit the same problems we saw with this monitor. The monitor's color gamut is limited to 72 percent of the NTSC color space, but that's not unusual, either.

The rest of this monitor's shortcomings seem minor by comparison, but we're very critical of its mirror-like nature. We found ourselves perpetually distracted by specular reflections whenever there was a source of bright light behind our chair—including daylight passing through windows in an adjacent room. This was much less of an issue when we darkened the room and the only source of light was above the monitor, but those are restrictions we're not willing to put up with. And while we welcome the presence of an HDMI port, we were surprised to discover that the monitor has

a VGA port as well, but no DVI port. Adding insult to injury, HP doesn't pack an HDMI cable in the box. VGA and analog audio cables are included, however, so you won't be left completely high and dry when you bring the monitor home. Come on, HP, if you're going to leave a cable out of the deal, why not omit the one that no one will use anyway?

The w2338h performed surprisingly well in our Blu-ray test, especially when it came to the many scenes in *Watchmen* that unfold in deep shadows. But the built-in speakers are so underpowered that we couldn't hear much of the dialog even when we cranked the dinky 2-watt amp to its maximum output. We encountered the same problem while playing the dialog-rich *Fallout 3*. The audio issue wouldn't be as much of a problem if there was a headphone jack that you could plug headphones or powered speakers into, but there isn't one.

If you're in the market for an inex-

pensive monitor, there are plenty to be had. Don't settle for this one. —MICHAEL BROWN



The HP w2338h's stand is one of the features we do like. It tilts and swivels, or you can remove it entirely to mount the display on the wall.

### SPECIFICATIONS

Viewable Area	23 inches
Native Resolution	1920x1080
Color Gamut	72 percent of NTSC
Color Depth	6-bit with FRC
Gray-to-Gray Response Time	5ms
Inputs	HDMI, VGA



VERDICT

4

HP W2338H

#### + CREME BRULEE

Very good black levels; removable stand tilts and swivels; controls are easy to use.

#### - YELLOW MATTER CUSTARD

No DVI port; no headphone jack; egregious color-tracking errors; specular reflections.

\$300, [www.hp.com](http://www.hp.com)



# Asus G51Vx-RX05

This budget notebook will make gamers smile

If there's one thing that might take your mind off your financial woes, it's some good old-fashioned fragging. And Asus is happy to oblige by offering the most affordable full-fledged gaming notebook that we've ever tested. The G51Vx-RX05, sold exclusively through Best Buy, costs less than a grand—OK, at \$999, that's a technicality, but still, this 15-inch notebook is cheap. It's half the cost of the 15-inch iBuypower M865TU gaming rig we reviewed in November.

Of course, Asus had to cut some corners to get there. The notebook's Core 2 Duo P7350 CPU, for example, boasts a mere 2GHz clock speed—that's 33 percent slower than the iBuypower's proc. And true to form, the G51Vx-RX05 performed about 30 percent slower than the iBuypower (our new zero-point rig) in our Premiere, Photoshop, ProShow, and MainConcept benchmarks.

A Power Control Panel option in the G51Vx-RX05 lets you overclock the CPU by up to 150MHz. That's a 7.5 percent boost, which amounted to around five percent of additional performance in our CPU-centric benchmarks: Using the so-called "Extreme turbo" mode, we shaved 11 seconds off our original Photoshop time and a minute off of Premiere Pro. That doesn't do much to bridge the gap between the G51Vx-RX05 and its higher-clocked competition, but it does add some value to the package.

Where you'll find the most value, however, is in the notebook's GPU. The G51Vx-RX05 sports the same GTX 260M graphics part as iBuypower's machine. As we noted in our review of the iBuypower rig, this GPU performs head and shoulders above any previous-generation mobile part, serving up playable frame rates in today's more graphically demanding games. Although



If you're not crazy about the G51Vx-RX05's blue-backlit keyboard, a function button lets you dim or disable the lights.

iBuypower's much-faster CPU gives that machine a slight edge in games (and effectively knocks Asus's rig off our benchmark chart), the G51Vx-RX05's game performance is still laudable. Compared to Toshiba's 9800M-equipped Qosmio X305 (reviewed in June), the G51Vx-RX05 was more than 20 percent faster in Far Cry 2 and Call of Duty 4. In Crysis even, Asus's rig hit 30.48fps with the settings at High—that's 30 percent faster than the Qosmio performed.

Physically, the G51Vx-RX05 seems solid. Its glossy white cover, glossy black trim, and blue-backlit keyboard give it an unmistakable gaming aesthetic that's not too outlandish. Its rubberized palm rest adds a nice, comfy touch. And while its 15.6-inch reflective screen sports a relatively low 1366x768 native res, that can actually be

a boon in games.

Does the G51Vx-RX05 make compromises? Yes. But in doing so, it delivers on its mission to provide top-notch gaming at an unbeatable price. And for that, this notebook deserves high marks.

—KATHERINE STEVENSON

## SPECIFICATIONS

CPU	2GHz Core 2 Duo P7350
RAM	4GB DDR2/800MHz
Chipset	Intel PM45
Hard Drive	320GB Seagate ST9320421AS (7,200rpm)
Optical	HL-DT-ST DVD/DRAM GSA-T50N
GPU	Nvidia GeForce GTX 260M
Ports	VGA, HDMI, Ethernet, modem, four USB, eSATA, FireWire, three analog in/out, 8-in-1 media reader, Express Card slot
Lap/Carry	8 lbs, 12.8 oz / 7 lbs, 4.6 oz

## BENCHMARKS

### ZERO POINT

Benchmark	Asus G51Vx-RX05	iBuypower M865TU	% Change
Premiere Pro CS3	1,320 sec	1,860	-29.0%
Photoshop CS3	147 sec	205	-28.3%
Proshow Producer	1,504 sec	2,255	-33.3%
MainConcept	2,702	4,057	-33.4%
Far Cry 2	31.1	29	-6.8%
Call of Duty 4	58.3	55	-5.7%
Battery Life	100.0	92	-8.0%

Our zero point notebook is an iBuypower M865TU with a 3.06GHz Core 2 Duo T9900, 4GB DDR3/1066 RAM, a 500GB Seagate hard drive, a GeForce GTX 260M, and Windows Vista Home Premium 64-bit. Far Cry 2 tested at 1680x1050 with 4x AA; Call of Duty tested at 1680x1050 with 4x AA and 4x anisotropic filtering.

VERDICT **8**

ASUS G51VX-RX05

### BIONICS

Great mobile gaming on the cheap; less cumbersome than larger gaming rigs.

### CRYONICS

Relatively wimpy CPU; battery drained in 92 minutes; speakers aren't great.

\$1,000, [www.bestbuy.com](http://www.bestbuy.com)

# Thermaltake Level 10

## Drop-dead gorgeous, but does it go to 11?

**W**hen we first saw prototypes of Thermaltake's Level 10 concept chassis back in May, we were intrigued by its unique design but skeptical as to whether Thermaltake would ever actually produce it—and if it did, whether it would be any good. The answer to the first question is yes—it should be shipping by the time you read this. But is the most inventive chassis we've laid hands on since the Antec Skeleton actually a good case?

The Level 10, which Thermaltake designed with BMW, is not your standard ATX full-tower. Instead of a simple box shape, the Level 10 hangs its components from a central wall—basically a reinforced version of a standard case's right side and frame. From this central wall protrude individual hinged covers: one each for PSU, optical drives, and the main motherboard compartment, as well as six SATA drive bays connected to a vertical aluminum heatsink. All cables between compartments are routed through the central pillar, behind the motherboard and drive trays, just like a standard case, resulting in an incredibly clean look—at least when the covers are closed. Red LEDs light a strip running from the front panel (with its four USB ports, one eSATA port, and audio ports), along the top to the rear. The case is huge, too, weighing 47 pounds and measuring 12.5 inches wide by 2 feet deep by 26 inches high.

Building in the Level 10 is a bit involved. First, you unlock two barrel locks on the rear panel, which keep the compartments securely shut when the case is in use. Only then can you remove the rear panel and open the compartment bays. The motherboard tray and its attendant rear expansion slots/backplane are removable, making the install process much easier. The motherboard and PSU compartments open 90 degrees—the optical bay opens only around 45 degrees, but the cover is removable.

Though you won't get the typhoon-like airflow of other cases, the Level 10 still offers respectable cooling. The motherboard compartment contains a 14cm front intake fan and a 12cm exhaust fan, both with red LED lighting. The side of the bay door has filtered vents for additional airflow. Unfortunately, unless you have a self-contained water-cooling apparatus like the Corsair H50 or Cool-it Domino, water-cooling is not an option, as there's no room for a reservoir, nor passages for the tubes.

The PSU compartment has mesh vents on the bottom to accommodate PSUs with downward-facing fans. And as previously mentioned, the six hard drive bays are attached to a tall aluminum heatsink, which has two 6cm fans blowing air through the middle of it.

The design is absolutely fantastic. But for a \$700 case, the Level 10 is strangely lacking in some departments. The six SATA bays each accommodate either a 3.5-inch or 2.5-inch drive, and each has an LED that lights when the bay is in use, but only the top two bays ship with SATA backports. For \$700, we expected all six to be usable off the bat. And although the top optical bay has a front fascia to stealth your drive, the bottom two bezels are inexcusably cheap-looking.

The barrel locks on the case are a bit janky and can make the back panel difficult to put back on. And the matte finish, though preferable to the glossy finish that initial renders of this case were shown with, is a dust collector. Finally, and perhaps inevitably, the compartment doors tend to sag slightly on their hinges when open, due to their weight.

The Level 10 is an excellent and inspired work of design, and a slightly less inspired work of engineering. For \$700, we like a bit more solidity to a case, weight be damned. If you're looking for the best performance you can wring out of your rig, your \$700 may be better spent elsewhere. But if you're looking to get a good case that makes an unmistakable statement, the Level 10 certainly fits the bill. —NATHAN EDWARDS



Clockwise from upper left: PSU compartment, optical drive compartment, hard drive bays, and motherboard compartment.



VERDICT

8

### THERMALTAKE LEVEL 10

#### + GOES TO 11

Superb design; adequate ventilation; removable mobo tray; thermally isolated compartments.

#### - NEIN

Stupid expensive; heavy; ships with only two SATA backplanes; janky locks.

\$700, [www.thermaltakeusa.com](http://www.thermaltakeusa.com)



The Thermaltake Level 10 is one of the most gorgeously designed cases we've ever tested.

# OCZ Agility EX 60GB SLC SSD

## SLC makes a comeback

It's been a long time since we tested a single-level cell (SLC) SSD, as the market has moved almost entirely over to multi-level cell (MLC) designs. MLC is favored because it's cheaper to produce and each cell can store two bits of data, rather than one, so you can cram more storage into each flash unit. On the other hand, SLC is faster and is rated for 100,000 read/write cycles, as opposed to 10,000 for MLC. Naturally, SLC is preferred for enterprise solutions, while MLC has captured the consumer market. But with the introduction of the (relatively) affordable Agility EX series, OCZ is hoping to win back some of the consumer market for SLC.

The 60GB Agility EX pairs the popular Indilinx Barefoot controller—responsible for this generation's blazing-fast, stutter-free SSDs—with 64GB of onboard SLC NAND. It's worth noting that this is the same capacity as a standard 64GB SSD; OCZ just uses a binary naming convention. In our tests, the Agility EX's sustained read speeds topped off at around 197MB/s, or approximately six percent slower than the second-gen Intel X-25M. Sustained write speeds, at 175MB/s,

were the same as with the Patriot Torqx, an MLC drive using the same Indilinx controller. But the Agility really shone in application tests, with a five percent faster Premiere Pro encoding time and a 13 percent higher PCMark Vantage HDD score than the Torqx.

At \$400, the Agility EX is twice as expensive as 64GB MLC drives using the same architecture. But its performance is right up there with the best we've ever tested. The fact that its life span is 10 times that of an MLC drive is attractive, to be sure, but seems unnecessary for consumers—after all, how many of you are still using 10-year-old hard drives? The Agility EX is a great drive, but SLC life spans (and SLC prices) may just be overkill, even for enthusiasts. —NATHAN EDWARDS

BENCHMARKS			
	OCZ Agility EX (SLC)	Patriot Torqx (MLC)	Intel X25-M G2 (MLC)
Capacity	60GB	128GB	160GB
Average Sustained Transfer Rate Read (MB/s)	197.5	205.4	<b>209.1</b>
Average Sustained Transfer Rate Write (MB/s)	<b>175.5</b>	175.1	79.5
Random-Access Read (ms)	<b>0.11</b>	<b>0.11</b>	0.13
Random-Access Write (ms)	0.24	0.31	<b>0.08</b>
Premiere Pro (sec)	<b>647</b>	674	696
PCMark Vantage Hard Drive	<b>24,070</b>	21,247	23,288

Best scores are bolded. All drives were tested on our standard test bed using a 2.46GHz Intel Core 2 Quad Q6700, EVGA 680i SLI board, HDTach 3.0.1.0, h2benchw, and Premiere Pro CS3 scores were obtained in Windows XP; PCMark Vantage 2005 scores were obtained in Windows Vista Home Premium 32-bit.

OCZ AGILITY EX 60GB SLC SSD
7

**+ DEX**

Blazing-fast speeds; 10x the life span of MLC drives.

**- CHA**

Costs twice as much as MLC drives of same capacity; do consumers need a 60GB drive that lasts for decades?

\$400, [www.ocztechnology.com](http://www.ocztechnology.com)



The OCZ Agility EX is billed as an affordable SLC drive for consumers. Affordable, of course, is relative.

# Cooler Master Hyper 212 Plus

Don't call it a comeback

At first glance, the Hyper 212 Plus seems like Cooler Master's original Hyper 212 with a different fan mounting system and support for sockets 1156 and 1366. But while the original had two sets of heat dissipation fins, one set for each end of the heat pipes, the 212 Plus adopts a more straightforward tower design, with the heatsink fins connected to both ends of each heat pipe. It's the same basic and effective design seen in all of today's top-performing air coolers. And unlike most coolers, the 212 Plus's heat pipes contact the CPU directly. So, how do the Hyper 212 Plus's stacks stack up against the competition?

The Hyper 212 Plus is one of the smaller air coolers we've tested recently—a big relief after last month's monstrous Scythe Mugen 2. At 4.7 inches wide, 3.1 inches deep, and 6.2 inches

screws for the mounting bracket. Once the cooler was secure, we mounted the included 12cm fan using common wire retention clips—a simple task made difficult by the close proximity of the cooler to the north bridge's cooling fins.

The direct-contact heat pipes make the cooler/CPU interface less uniform than we're used to—there are definite ridges between the heat pipes and the rest of the heat exchanger. But after testing the Hyper 212 Plus, we wonder if Cooler Master knows something the rest of the industry doesn't, because the 212 Plus's cooling power is formidable. At 100 percent CPU utilization, the 212 Plus cooled our CPU to 43.5 C, nearly 30 percent lower than the stock cooler's 61 C. Our previous favorite, the Thermalright U120 eXtreme, by comparison, cooled it to 46.75 C. Idle temps for both coolers were nearly identical—about 15 percent cooler than stock.

We've seen a spate of top-performing air coolers in the past few months, as nearly every manufacturer hops on the skyscraper-design bandwagon, and Cooler Master's entry is right up there with the best we've tested. And at \$30 from Cooler Master's online store, it's dirt cheap. For that price, you really can't go wrong with this cooler. —NATHAN EDWARDS

## BENCHMARKS

	CM Hyper 212+	Thermalright U120-eXtreme	Stock Cooler
Idle (C)	<b>29.5</b>	29.75	34.5
100% Burn (C)	<b>43.5</b>	46.75	61

Best scores are bolded. Idle temperatures were measured after an hour of inactivity; load temperatures were measured after an hour's worth of CPU Burn-In (four instances). Test system consists of a stock-clock Q6700 processor on an EVGA 680i motherboard inside a Corsair 800D case with stock fans.

high, the Hyper 212 is shorter than our champion, Thermalright's U120, though it's about an inch deeper. It's also about a pound lighter, at 1.4 pounds to the Thermalright's 2-plus pounds. Despite its relative lack of bulk, though, it managed to bump right up against the north-bridge heat spreaders on our EVGA 680i SLI board—a problem that would be avoided if the cooler's fins started a half-inch higher up the pipes. To install the 212 Plus, we had to insert four stand-off pegs into the motherboard and tighten them by bolting them to the backplate. An x-shaped bracket with spring screws at the corners holds the cooler to the CPU. We like this approach because it makes the cooler easy to install without having to worry about the backplate falling off, and the standoffs allow the use of shorter



**VERDICT** 10

**COOLER MASTER HYPER 212 PLUS**

<p><b>+</b> <b>HIGH FIBER</b></p> <p>Dirt cheap; effective cooling.</p>	<p><b>-</b> <b>HIGH FRUCTOSE</b></p> <p>Can bump up against north-bridge chip cooler.</p>
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\$30, [www.cooler-master.com](http://www.cooler-master.com)



The Cooler Master Hyper 212 Plus's heat pipes contact the CPU directly, which helps it compete with larger coolers.

# Trendnet TEW-639GR Wireless Router

## Fast, cheap, and in control

**T**rendnet's TEW-639GR 802.11n router is an ugly duckling that will never grow into a beautiful swan. It also just happens to be the fastest router we've tested in some time. It performs well at range, includes a Gigabit Ethernet switch, and with an \$80 street price, it's cheap, too!

The three external antennae aren't to blame for this router's homeliness—in fact, we welcome that design choice if it accounts for the router's excellent performance. Rather, it's the ultra-cheap plastic shell and the glowing indicator light that screams “wireless router!” like the vacancy sign at a no-tell motel that make this device look so cheesy.

Before we dive into a discussion of what this router can do, let's cover any limitations that might be deal-breakers for you. This is a single-band router that operates on the 2.4GHz frequency band only, so if your air space is crowded with other people's APs or you're looking for a router to pair with your dual-band media streamer, look elsewhere. Likewise if you're using a VoIP device, since the router's quality-of-service features are limited to enabling Wi-Fi Multimedia. Lastly, Trendnet didn't outfit the TEW-639GR with a USB port, so you can't set it up to function as network attached storage or use it to share a printer over your network.

But if you're looking for fast wireless throughput on the cheap, the TEW-639GR offers an excellent price/performance ratio. With channel bonding enabled, we achieved TCP/IP throughput of 96.4Mb/s in our kitchen test, where the client is 20 feet from the router and separated by an insulated wall and a set of plywood cabinets. That's slightly faster than our longtime champion, the Linksys WRT-600N, which managed throughput of 95.2Mb/s. The Trendnet couldn't beat the Linksys when it came to reaching the client PC in

our isolated media room, but it came close, delivering TCP/IP throughput of 23.9Mb/s, compared to the Linksys's 29.6Mb/s. The challenger pummeled the champ in our long-range performance, though, with the Trendnet achieving throughput several times faster than the Linksys when the client was placed outdoors.

Trendnet's TEW-639GR doesn't offer enough advanced features to earn a spot on our Best of the Best list, but it is a solid performer with an attractive price tag and definitely worthy of consideration.

—MICHAEL BROWN

### BENCHMARKS

	Trendnet TEW-639GR	Linksys WRT-600N
Kitchen/20 feet (Mb/s)	<b>96.4</b>	95.2
Patio/38 feet (Mb/s)	64.6	<b>70.0</b>
Bedroom/60 feet (Mb/s)	27.0	<b>29.6</b>
Media Room/35 feet (Mb/s)	23.9	<b>35.4</b>
Outdoors 1/90 feet (Mb/s)	<b>5.8</b>	1.9
Outdoors 2/85 feet (Mb/s)	<b>3.2</b>	0.4

Best score in each scenario is bolded. A detailed explanation of how we test Wi-Fi routers can be found at <http://bit.ly/16w270>.



### VERDICT



#### TRENDNET TEW-639GR ROUTER

**+ XAVIERA HOLLANDER**

Fast throughput, especially at range; inexpensive.

**- HEIDI FLEISS**

Single-band only; very limited QoS features; ugly as sin.

\$75, [www.trendnet.com](http://www.trendnet.com)



**The Trendnet TEW-639GR might look like a cheap tart, but there's a heart of gold beneath that garish plastic.**



# Synology DS409+ NAS

Powerful and feature-rich, but not for newbs

The Synology DS409+, though targeted at small- and medium-size business owners, is a great addition to any home network, with a robust web admin panel, media streaming of all stripes, cross-platform support, and easy backup—of the computers on your network, and of the NAS itself. To call this merely “network-attached storage” does the device a disservice.

The DS409+ is a squat brown-black box with a minimalist feel, and it ships sans drives, so you’ll have to provide your own. The ports are on the back of the device and include two USB 2.0, one eSATA, and one Gigabit Ethernet. In addition to two 8cm fans, the hinged back panel contains four thumbscrews, which, once unscrewed, allow the panel to open and the top of the case to lift off. The DS409+’s four hard drive trays accommodate 3.5-inch or 2.5-inch drives, which must be screwed into the trays and slotted into the NAS box’s SATA backplane. The DS409+ can be configured with up to 8TB of storage; we tested ours with four 750GB Samsung Spinpoint HD753LJ 7,200rpm hard drives in RAID 5, making a 2TB volume. (The DS409+ also supports JBOD and RAID levels 0, 1, 5 + spare, and 6.)

With its 1.06GHz Freescale CPU and 512MB of RAM, the DS409+ turned in excellent performance. We transferred a 2.79GB file from our PC to the NAS in just a minute and a half, and from the NAS to the PC in 60 seconds; 600MB of smaller files took just 22 seconds to copy to the NAS, and 18 seconds the other way. That’s better performance than Seagate’s BlackArmor 440 (reviewed in August), which has a higher-clock processor but half the RAM of the Synology.

The web administration panel is incredibly



The staid exterior of the Synology DS409+ belies its feature-packed but slightly obtuse web interface.

full-featured—and slightly daunting. Admins can see at-a-glance data on disk usage, S.M.A.R.T. hard drive diagnostics, user quotas and permissions, and the status of network services. And oh, the services! In addition to the by-now-standard fare of iTunes and DLNA/UPnP media streaming, the updated firmware lets the DS409+ act as a web server, hosting PHP and MySQL databases, an FTP server, and a mail server. The DS409+ also supports terminal access via telnet/ssh. One of our favorite features, AudioStation, can stream your music library to any computer, iPhone, or Windows Mobile smartphone. Or the DS409+ itself can act as a jukebox if you connect it to a set of USB speakers. PhotoStation does the same for photos. Surveillance Station acts as a control panel for your networked webcams; Download Station lets you schedule BitTorrent,

FTP, RapidShare, and other P2P downloads—you get the idea. The included Data Replicator 3 software lets users back up their local machines to their private folders on the NAS.

The DS409+’s web interface gives you a satisfying amount of control over a dizzying array of features, and though it’s not very user-friendly, we can’t complain about a lack of amenities. It’d be nice if the drives were more accessible—we liked the front-mounted hot-swap bays on the Seagate BlackArmor 440—and \$550 is steep for a device that ships without drives. Ultimately, though, the DS409+ is a powerful and speedy NAS device that is just as appealing to the home networker as to the SMB owner, and we don’t hesitate to recommend it. —NATHAN EDWARDS

## BENCHMARKS

	Synology DS409+	Seagate BlackArmor 440
Size as tested	3TB (2.25TB in RAID 5)	6TB (4.5TB in RAID 5)
PC to NAS, small (min:sec)	<b>0:22</b>	0:39
PC to NAS, large (min:sec)	<b>1:31</b>	2:38
NAS to PC, small (min:sec)	0:18	<b>0:17</b>
NAS to PC, large (min:sec)	1:00	1:04

Best scores are bolded. We used the contents of Maximum PC’s November 2007 CD for the small-file testing, and a single 2.79GB file for the large-file testing. All scores are averages of three transfer trials.

9

VERDICT

SYNOLOGY DS409+ NAS

**+** SYNAPSE

Fast performance; incredible array of features and services.

**+** CYLONS

Expensive for a machine that ships driveless; web interface is somewhat obtuse.

\$550 (no drives), [www.synology.com](http://www.synology.com)

# Verizon MiFi 2200

## Meet a 3G-connected Wi-Fi access point that fits in your pocket

**W**hen you're ready to step up to the world of cellular broadband connections, there are lots of options. The removable PC Card, USB, and Express-Card modems deliver great performance and work with pretty much any PC, but they'll connect only one machine at a time to the Internet—that is, unless you can successfully set up connection sharing in Windows. And while we love the always-on nature of modems integrated in notebooks, their permanent association to a single machine makes the external cards seem positively promiscuous by comparison. Enter the MiFi 2200.

Inside this tiny device—it's about the same size as a stack of six credit cards—is not only a 3G wireless modem, but also a Wi-Fi access point and a battery to power the whole thing. That's right, the MiFi 2200 lets you and four of your closest pals connect to the Internet anywhere there's a 3G cell

signal. We tested the MiFi with two computers and a Wi-Fi-enabled phone and were pleased with the results. The battery-powered MiFi seems designed to work with PCs that are no more than 10 feet away. While we had signal further out in some test environments, we found it worked best up close.

To test signal, we took the MiFi to locations throughout the Bay Area, connected a laptop to the device and used Speedtest.net to measure latency, upstream, and downstream performance (see table). We tested the Verizon version of the MiFi 2200, but it's available in AT&T and Sprint, as well. We wouldn't want to use the MiFi's connection for gaming or uploading video—it's roughly analogous to an inexpensive DSL line—but it's great for browsing and checking email.

Configuring the MiFi is simple. Plug it into a USB port on your PC and install the software from the integrated flash drive to activate the MiFi. Then unplug it and log into the pre-configured Wi-Fi access point. Once there, you can change many settings common to simple routers—including Wi-Fi security mode and SSID. There's no driver disc to lose, and most of the settings are accessible using your browser after the initial configuration.

There are a few problems with the MiFi. The power switch is much too easy to turn on accidentally. That said, we didn't experience battery life problems as a result—even under heavy usage, the MiFi lasted at least a couple of days. We were also disappointed that there isn't a way to charge the MiFi using a laptop's USB port without also disabling the Wi-Fi access point. Whenever you plug it into a live USB port, even a standard USB charger, it behaves like a standard USB cellular modem.

The MiFi isn't perfect, but for the same monthly cost as a single-PC card or USB adapter, it's a great deal for anyone who wants to connect more than one PC to the Internet... from pretty much anywhere. —WILL SMITH

### BENCHMARKS

	Office	Home	San Mateo	San Francisco
Download (kB/s)	247.1	140.9	162.74	152.64
Upload (kB/s)	80.5	70.9	74.6	77.3
Latency (ms)	92	95	81	99

Benchmarks were measured using a MacBook Pro running Windows 7 RC. The Office and Home tests were run inside buildings, while the others were outside.

**VERDICT** 9

**VERIZON MIFI 2200**

<b>+ RADAR</b> Tiny; connects five devices to the Internet; as fast as cheap DSL.	<b>- SONAR</b> As fast as cheap DSL; turns on accidentally; requires expensive service plan.
--	---

\$99 w/two-year contract: 250MB for \$40/month, [www.verizon.com](http://www.verizon.com)

The MiFi 2200 is about the size of a stack of six credit cards, but it packs a battery, a 3G cellular data modem, and a Wi-Fi access point into its slick black plastic shell.

# Photoshop Elements 8.0

## New version adds face recognition, little else

Every fall, you should set the clock back an hour, change the battery in the smoke alarm, and determine whether it's worth paying for the annual update to Photoshop Elements.

This year, Adobe hits the lucky number eight with the popular photo management app and finally adds the Holy Grail of photo organization tools: face recognition technology. Face recognition software is a boon to those of us who like to push the shutter button but aren't organized enough to tag the photos with anything useful. With face recognition, the promise is that you won't have to search through gigabytes of photos anymore, you'll just ask Elements 8.0 to find all the pictures of Susannah taken in 2009. Elements 8.0 combines the face recognition technology with its smart tagging, so you could also tell it to find all pictures of Susannah that are in group shots that are in focus. Again, the feature goes a long way toward taming our vast gigabytes of digital images.

But Adobe wasn't the only company to introduce a face recognition feature this year. Google rolled similar technology into its freebie Picasa 3.5. To find out which app was better at faces, we imported 20GB of photos into each organizer. The verdict? We found Photoshop Elements 8.0 to be more accurate, especially with children. However, the recognition process was tedious compared to Picasa 3.5, which would automatically recognize all of the photos and then ask you to approve them. Photoshop Elements 8.0 required us to select the photos we wanted recognized. But since Picasa isn't as accurate, you might end up spending more time sorting out the misses.

Performance was also an issue. While Picasa 3.5 felt snappy, Elements 8.0 felt slow on our 2.66GHz Core i5-750 box. Disappointingly, neither app was optimized for quad-cores.

Elements isn't just about face recognition, of course. It's also a powerful full-scale photo editor with RAW support for the latest cameras. As always, it's almost like a wrapper for the full version of Photoshop. In complexity terms, if Photoshop is Flight Sim X, Photoshop Elements 8.0 is HAWX.

Other new features in Elements 8.0

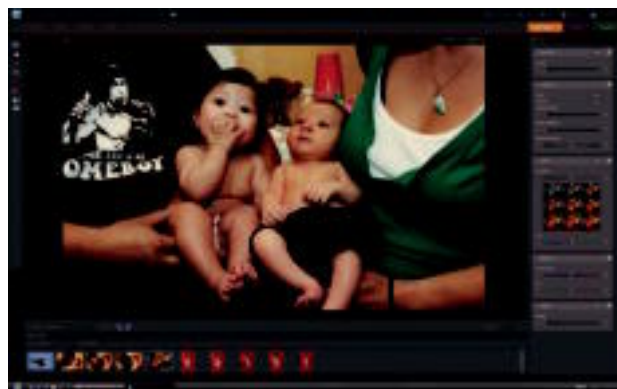


We found the face recognition feature in Elements 8.0 to be more accurate than in Google Picasa 3.5.

include a really handy exposure merge for combining photos. For example, you can take a night photo where the foreground is well lit by flash and merge it with one where the background is well lit. Also borrowed from Photoshop CS4 is the ability to intelligently "squeeze" photos together. This lets you easily move objects, such as two people standing too far apart, closer together.

There are a few other small updates to the app, such as thumbnails of changes before you apply them, but for the most part, the Elements package isn't radically different from its predecessor. So, unless face recognition is a feature you've been pining for, Photoshop Elements 7.0 users will be fine skipping the update. For folks who are currently on the hunt for a photo editor, it's a worthy choice and still our top recommendation for tyros.

—GORDON MAH UNG



Photoshop Elements 8.0 now gives you quick previews of some fixes before you apply them, so beginners can see what impact a change will have.

VERDICT		8
ADOBE PHOTOSHOP ELEMENTS 8.0		
<p><b>+</b> ALFRED STIEGLITZ</p> <p>Accurate face recognition and merge features are well worth the ducats.</p>	<p><b>-</b> ALFRED E. NEWMAN</p> <p>Needs multicore optimization and an easier way to recognize more photos.</p>	
\$90, <a href="http://www.adobe.com">www.adobe.com</a>		

# Borderlands

A stunning combat experience diminished by a series of small flaws

**B**orderlands is an undeniably fun game with a killer concept, innovative game mechanics, a gorgeous art style, and kick-ass cooperative gameplay, but it also includes some frustrating design choices that require the player to bend to the limitations of the game. If you can do that, and you enjoy shooters and Diablo-esque action RPGs, you're going to love this game.

The sales pitch for Borderlands is simple: It's first-person Diablo... with guns. While exploring a large, open, post-apocalyptic world, you complete quests, collect loot, and go on adventures with up to three of your pals. While it may sound like Fallout 3, Borderland's shooter heritage is obvious—the combat is fast and furious without the maddening influence of a random-number generator to take your shots off target. The game feels more like Quake than any RPG.

In the beginning, you'll choose from one of four characters—sniper, stealth, tank, or a gunner/support hybrid—and progress through a series of quests, gaining experience and leveling up. With a WoW-esque triple-branched skill tree, you can customize your character with skills to increase your damage, improve your survivability, or help your pals.

Borderland's dynamic loot-generation system is awesome. After every encounter, you'll pick up weapons, shields, grenades, and other items that are randomly created by the game using beaucoup modular components. With millions of possible combina-



**It's usually more effective to hop out of your buggy to kill mobs than to use the vehicle's weapons, but if you don't mind taking a little damage, you can run over almost anything.**



**Killing bandits is both fun and satisfying, whether it's with acid, electricity, explosives, fire, or just good old-fashioned bullets.**

tions, you'll never see the same gun twice. Ultimately, though, the more powerful weapons are balanced by shortcomings in clip size, accuracy, or firing rate.

With a few friends, the game gets even better. The baddies get stronger, forcing the players to work together in order to succeed. As the difficulty goes up, the loot gets better, too. With four players connected, you'll see rare drops after nearly every fight. Unfortunately, in order to advance your character when you play with your pals, you need to be within a few levels of them, and at the same point in the main quest (or further along). If you get too far ahead or behind, you won't get any experience and won't be eligible for any of the quests or the experience and loot that comes with them. The solution is to have the player who is furthest behind in the story host the game, but that can be a hassle.

Travel can be difficult in Borderlands. There's no mini-map on the HUD, which left us frequently jumping out of the action to consult the full-screen map to find our goal. To make navigation even more difficult, the full-screen map shows only the area that you're currently in—there's no in-game map that shows how the different zones connect.

Despite these problems, the combat, boss fights, and weapons are a ton of fun. For the player willing to work around some minor flaws, Borderlands delivers a lot of value. In order to reach the level cap, you'll have to play through the story multiple times, but the game is designed to reward players who take the time with more challenging baddies and ever-better loot. —WILL SMITH

■ ■ ■		VERDICT	8
<b>BORDERLANDS</b>			
<b>+</b> ICELAND	<b>+</b> GREENLAND		
Amazing combat; millions of possible weapons; fun mashup gameplay.	Friends must be same level for multiplayer; no mini-map; no world map; no goal marker in fast travel.		
\$50, <a href="http://www.borderlandsthegame.com">www.borderlandsthegame.com</a> , ESRB: M			

# LAB NOTES

## Turn PhysX Back On

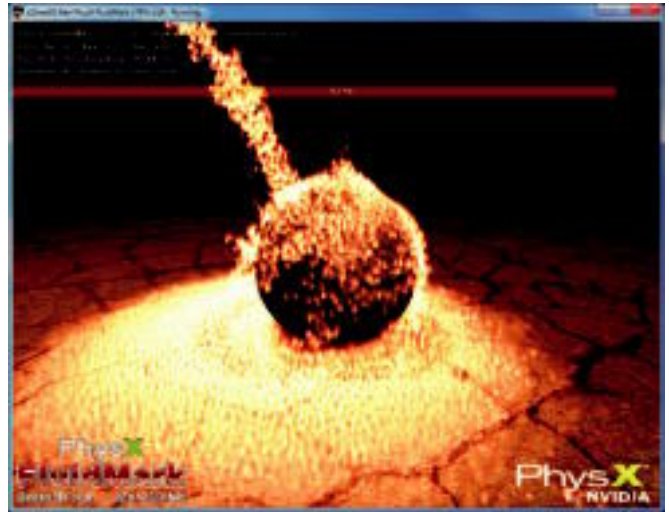
Re-enabling PhysX acceleration when your system uses an ATI card is tricky

Shortly after Nvidia disabled PhysX acceleration on systems with non-Nvidia GPUs, NGOHQ.com forum user GenL posted a hack for re-enabling the feature (<http://bit.ly/3RtHBp>), so naturally I had to try it out. After a couple of hours of fiddling, I managed to get a machine using a Radeon HD 5870 as the primary graphics card working with hardware-accelerated PhysX in Batman: Arkham Asylum and FluidMark, a PhysX benchmark.

Getting the hack installed required a boot into safe mode, running the patcher, and then rebooting the machine; however, it wouldn't work until I enabled a fake monitor in the Screen Resolution control panel. To add your own fake monitor, click the detect button, click the new monitor that shows up attached to the Nvidia card, and select the VGA option. After that, you should be able to enable accelerated PhysX in the games that support it. I tested with the 191.07 Nvidia drivers and the Radeon HD 5870 launch drivers, with absolutely no problems.



**WILL SMITH**  
EDITOR-IN-CHIEF



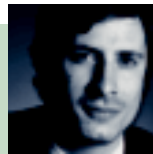
**NORMAN CHAN**  
ONLINE EDITOR

I've been stress-testing the streaming capabilities of the new WD TV Live, a media player that plays movie videos off of USB drives or NAS boxes. So far, high-definition Blu-ray rips stream over Ethernet with ease, but I plan on also testing the device with very-high bitrate raw video recorded from digital cameras like the Canon 5D Mark II.



**KATHERINE STEVENSON**  
DEPUTY EDITOR

I picked up some useful tips from this month's "Get Free" feature. For instance, I've found that the Library of Congress's photo catalog is a great resource for filling blank walls. With a nice photo printer and some decorative frames, the LoC's historical black-and-white images make for stylish and interesting accent pieces. I'm also getting lots of helpful hints about money from Mint.com.



**NATHAN EDWARDS**  
ASSOCIATE EDITOR

Thermaltake's Level 10 concept-turned-production chassis is as much of a head-turner as it is a back-breaker (50 pounds with no system in it). Everyone who passed by our office or Lab had to stop and stare at it. A few unnamed editors even tried to lick it. But for \$700, I expected a few more amenities. More than two SATA backplates, for starters.



**GORDON MAH UNG**  
SENIOR EDITOR

In preparation to move an older system to Windows 7, and in lieu of doing a proper clean install and manual move, I'm going to see if Laplink's PCMover can handle the bulk of the transfer without the usual two days of work. Read my report next month.

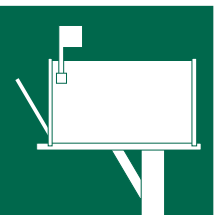


**ALEX CASTLE**  
ASSOCIATE ONLINE EDITOR

I've written about it here before, but now my MAME cabinet project has finally made it to the pages of the magazine! We've been having a lot of fun with the machine around the office, and I'm already looking forward to building another one. Next time, I think I'll go with an LCD screen—it's not as authentic, but much cheaper and easier to install.

We tackle tough reader questions on...

▶ Soundcard Advice  
 ▶ DIY Notebooks  
 ▶ Should News be Controlled?



**Is It Safe to Buy a Soundcard?**

I've been in need of a new soundcard for a very long time. I purchased a Creative Audigy 2 ZS just before the X-Fi was released. I don't want to make the same mistake again, and with Windows 7 and DirectX 11 coming out soon, I'm afraid to spend a lot of money on something that might be obsolete very soon. Any idea if there is going to be a new wave of audio technology coming out with the new OS and DirectX?

—Max Jackl

**Senior Editor Gordon Mah**

**Ung Responds:** I do not believe there are any significant changes in Windows 7 regarding audio technology and gaming. As we all know, Microsoft dropped DirectSound3D from Vista because it believed a large number of errors in XP were related to problems with audio hardware and drivers. (I guess that made Vista more reliable at launch, eh?) Most hardware vendors who still actually need hardware acceleration or DirectSound3D audio for games have adopted OpenAL or hacks to intercept the audio calls, such as Creative's ALchemy. So on that front, I'd say you're safe buying a new card—I can't guarantee, however, that a new, better soundcard won't come out immediately after you buy something.

**Windows Home Game Server**

I've been considering building a Windows Home Server

to back up my network. Your article on the subject in the November issue has convinced me to do it. However, I'm curious about the possibility of also using this machine as a local game server for my small LAN parties. If I purchased adequate RAM and a powerful enough CPU, could I install a few dedicated game servers and leave them running in WHS, or does this operating system not allow you to install stand-alone programs? If it is possible, would these game servers have to be installed to the separate system partition or could they go anywhere?

—Michael R. Matheson

**Online Editor Norman Chan**

**Responds:** Since Windows Home Server is basically a modified version of Windows, you can install programs on it just as you would any other PC. You'll just have to access the server's Desktop using Remote Desktop to install and configure your server software. We also recommend installing game servers as a Windows service so they launch at startup without requiring that a user or administrator log in. In addition, you can also run dedicated game server tracking software like HLStats (<http://bit.ly/4zpRYF>) on your Windows Home Server to monitor player statistics, though this is only recommended for advanced users.

**Blame It on the Ham Fists**

I'd like to build a new notebook using the latest and greatest technologies instead

of buying one. Some time ago, you guys ran a story on building your own notebook but warned against "ham fisted" users doing it. With several successful desktop builds behind me, I would like to now put my non-ham-fistedness to the challenge. Can you provide an updated list of resources for build-your-own notebook/laptop PC kits? Any help would be much appreciated.

—Leigh Mangubat

**Senior Editor Gordon Mah**

**Ung Responds:** Sadly, the DIY notebook never turned into the mobile equivalent of the desktop DIY game. That's likely because too many ham-fisted tyros didn't know what to do with the kits, plus DIY notebooks were never as configurable as their desktop counterparts. That doesn't mean the DIY notebook is dead. OCZ actually sells two DIY notebooks that can be bought today online at Newegg.com. Directron.com

■ ■ ■ NOW ONLINE

**The 50 Best (and Worst) Moments in Windows History**

Windows 7 marks another major chapter in the storied saga of Microsoft's ubiquitous operating system. But while this release is definitely a high point in Windows history, the development of Windows has been a roller coaster ride of successes, missteps, and downright embarrassments. We take a trip down memory lane to where it all began and see how Windows got to where it is today. Read the story at: <http://bit.ly/fGf99>.



also stocks a couple of MSI bare-bones notebooks.

## Where's the Hard Drive on My Lenovo S12?

As a proud owner of a Lenovo S12, I was wondering why Nathan Edwards would write that the hard drive is easily accessible (November 2009). I can't see a way to get to it. It is not under either access cover. Can you tell me where it is?

—Bob Sanges

### Associate Editor Nathan Edwards responds:

You're right, Bob, the hard drive isn't under either access cover on the S12—it's under the key-

Norton's logic when she sees no problem with other websites summarizing stories from newspaper websites (Quick Start, November 2009).

Reporting and writing quality journalism for newspapers and magazines costs a LOT of money, if done well.

I can't imagine that she would condone someone copying an author's book and then posting it on the web for all to read for free. Why should that kind of thing be allowed with newspapers? Newspapers are covered by copyright, just as books are.

Newspapers, as she mentions, are hurting. They need the hits from people going to

Many journalists I've talked to are horrified by this idea, and by the idea of their work languishing behind paywalls. Right now you like the *New York Times* and the *Washington Post*, but reporting is done by people.

If the reporters rebel, if the good people leave or stop joining newspapers because of measures like this, newspaper money won't buy good reporting from people who can make their living elsewhere and don't want publications stepping on their work.

## Ask an Engineer (Please!)

As an electrical engineer by trade, I have to take issue with your AC power adapter autopsy (December 2009). You got the smoothing capacitors and DC output right, but what you labeled as the transformers are actually inductors, and what you labeled as the rectifier is the transformer. The rectification is handled by the black devices that look like transistors attached to the metal heat-sink in the back. They could be power diodes, but it is also possible they are a type of thyristor. The inductors are probably used in this application to filter out harmonics induced by the rectifying process from back feeding on to the mains (120V).

—Jim Mayer

### Associate Editor Nathan Edwards responds:

Good catch, Jim. We've received a couple of letters about this from keen-eyed electrical engineers. We did our best to research all the parts we saw in the power supply and to figure out how they actually work, but we definitely goofed on this one. Next time, we'll consult a professional. ⚡

## WHAT SOME NEWSPAPER PEOPLE ARE ASKING FOR IS A RESTRICTION ON THE DISSEMINATION OF NEWS

board. To access it, remove the battery and flip your Lenovo 12 over. You'll see a Phillips-head screw hole with a little keyboard logo next to it directly below the RAM access panel. Remove that screw. Now flip the netbook over and open the lid. Between the keyboard and the top button row (the row with the power, volume, and quick-start buttons) you'll see a thin strip of plastic. Pry that up at both ends and remove it. You'll now be able to lift the top of the keyboard and gently remove it from the chassis. That rectangle in the upper right is the hard drive holder. Unscrew the two black Phillips-head screws and pull the black tab on the right to the right. That'll undock the HDD cradle from its SATA connector, and you can now replace your drive.

## News vs. Newspapers I don't understand Quinn

the newspaper websites to survive. I'm sorry, but I don't believe that everything should be free. I would pay to read the *New York Times* and the *Washington Post* because I expect more from them, and it is worth it for me to pay for that quality.

—Ken Spencer

### Contributing Editor Quinn Norton Responds:

You can't copyright ideas. The only way to stop somebody from summarizing a news article is to create a new limit on speech, even if we're calling it a copyright law.

What some newspaper people are asking for is a restriction on the dissemination of news—an idea that seems to pervert the very purpose of journalism. If I know my breaking scandal is legally embargoed, I can get out in front of it with my spin before it can be talked about on the net.



**LETTERS POLICY** Please send your questions and comments to [comments@maximumpc.com](mailto:comments@maximumpc.com). Include your full name, city of residence, and phone number with your correspondence. Letters may be edited for space and clarity. Due to the amount of mail we receive, we are unable to respond personally to all queries.

■ ■ ■ NEXT MONTH

# COMING IN MAXIMUM PC'S HOPING FOR A SNOW DAY JAN ISSUE

## Best of 2009

The most important people, places, and events of the year—culled, collated, and combined for your reading pleasure.

## In Search of the 11-Second Boot

Is there a machine nimble enough to boot in less than a quarter of a minute? We'll find out, and build it!

## Build Your own NAS Box

We've shown you how to build a Windows Home Server rig. Now we'll show you the ins and outs of FreeNAS!

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# AIR COOLER

## Cooler Master Hyper 212 Plus



**D**on't get us wrong: Our previous champ, Thermalright's Ultra-120 eXtreme, is still a fantastic cooler. But Cooler Master's Hyper 212 Plus does a few things slightly better. Its heat pipes contact the CPU directly, driving temps as low as we've ever seen from an air cooler. It helps, too, that the Hyper 212 Plus supports all major sockets, weighs 11 ounces less than the Ultra-120 eXtreme, and is cheaper, too. At \$30, you can't beat the Hyper 212 Plus's price/performance ratio. We wonder how many coolers we'll see with direct-contact heat pipes once word of this powerhouse's performance gets out. [www.cooler-master-usa.com](http://www.cooler-master-usa.com)

### THE REST OF THE BEST

■ **High-End Processor**  
Intel 3.33GHz Core i7-975  
[www.intel.com](http://www.intel.com)

■ **Midrange Processor**  
Intel 2.8GHz Core i7-860  
[www.intel.com](http://www.intel.com)

■ **Budget Processor**  
Intel 2.66GHz Core i5-720  
[www.intel.com](http://www.intel.com)

■ **LGA1366 Motherboard**  
MSI Eclipse SLI  
[www.msi.com](http://www.msi.com)

■ **LGA1156 Motherboard**  
Gigabyte GA-P55-UD6  
[www.gigabyte.us](http://www.gigabyte.us)

■ **Socket AM2 Motherboard**  
MSI K9A2 Platinum  
[www.msi.com.tw](http://www.msi.com.tw)

■ **High-End Videocard**  
ATI Radeon 5870  
[www.ati.com](http://www.ati.com)

■ **\$150 Videocard**  
ATI Radeon 4870  
[www.ati.com](http://www.ati.com)

■ **Performance Storage**  
Patriot Torqx 128GB  
[www.patriotmemory.com](http://www.patriotmemory.com)

■ **Capacity Hard Drive**  
Western Digital Caviar Black 2TB  
[www.wdc.com](http://www.wdc.com)

■ **DVD Burner**  
Samsung SH-S223  
[www.samsung.com](http://www.samsung.com)

■ **Blu-ray Drive**  
Pioneer BDR-2203  
[www.pioneerelectronics.com](http://www.pioneerelectronics.com)

■ **Full-Tower Case**  
Cooler Master ATCS 840  
[www.cooler-master.com](http://www.cooler-master.com)

■ **Mid-Tower Case**  
Silverstone Fortress  
[www.silverstonetek.com](http://www.silverstonetek.com)

■ **Gaming Mouse**  
Logitech G9 Laser Mouse  
[www.logitech.com](http://www.logitech.com)

■ **Gaming Keyboard**  
Logitech G19 Keyboard  
[www.logitech.com](http://www.logitech.com)

### Games we are playing

■ **Borderlands**  
[www.borderlandsthegame.com](http://www.borderlandsthegame.com)

■ **ARMA 2**  
[www.arma2.com](http://www.arma2.com)

■ **Warhammer 40K: Dawn of War II**  
[www.dawnofwar2.com](http://www.dawnofwar2.com)

■ **Star Wars: The Force Unleashed, Ultimate Sith Edition**  
[www.lucasarts.com](http://www.lucasarts.com)

For even more Best of the Best entries, such as speakers and budget components, go to <http://www.maximumpc.com/best-of-the-best>

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